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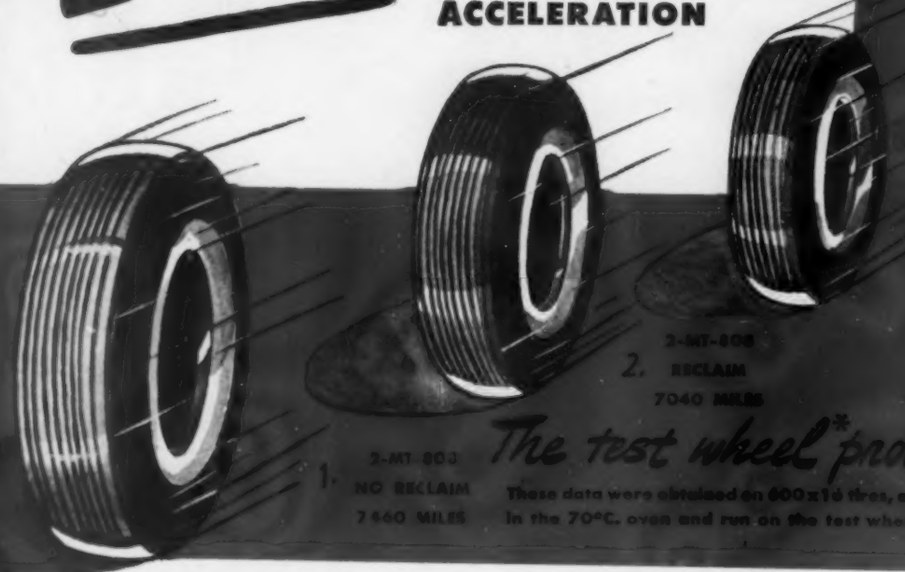

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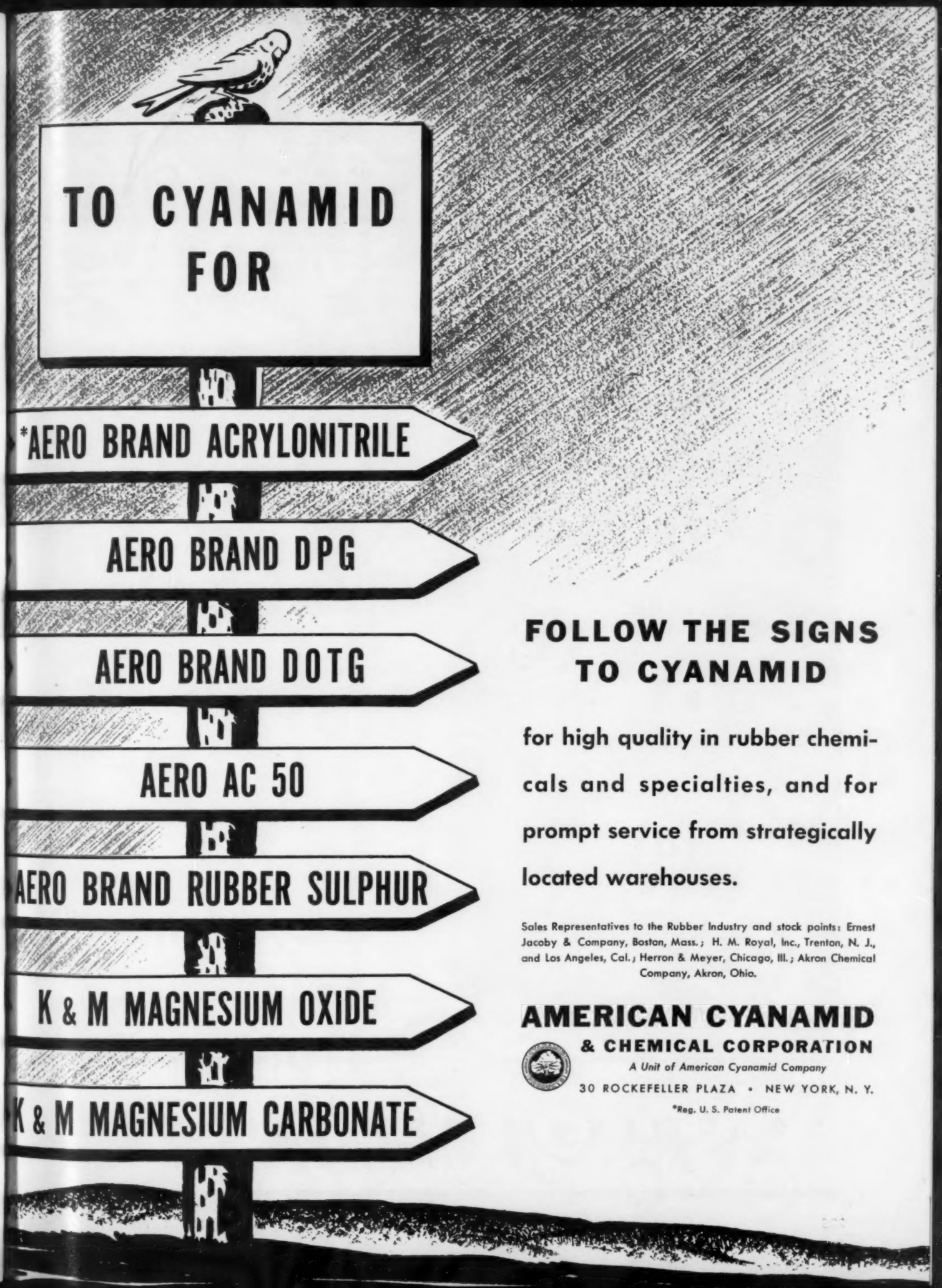

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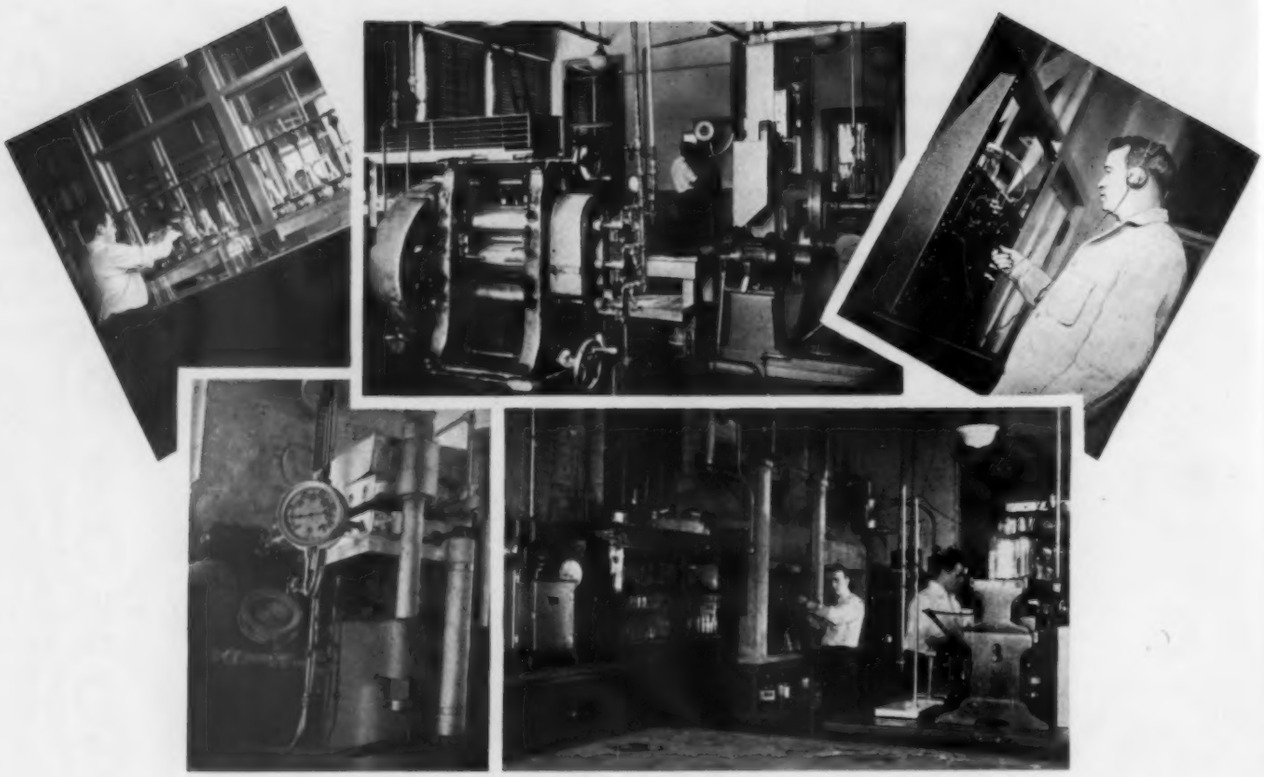

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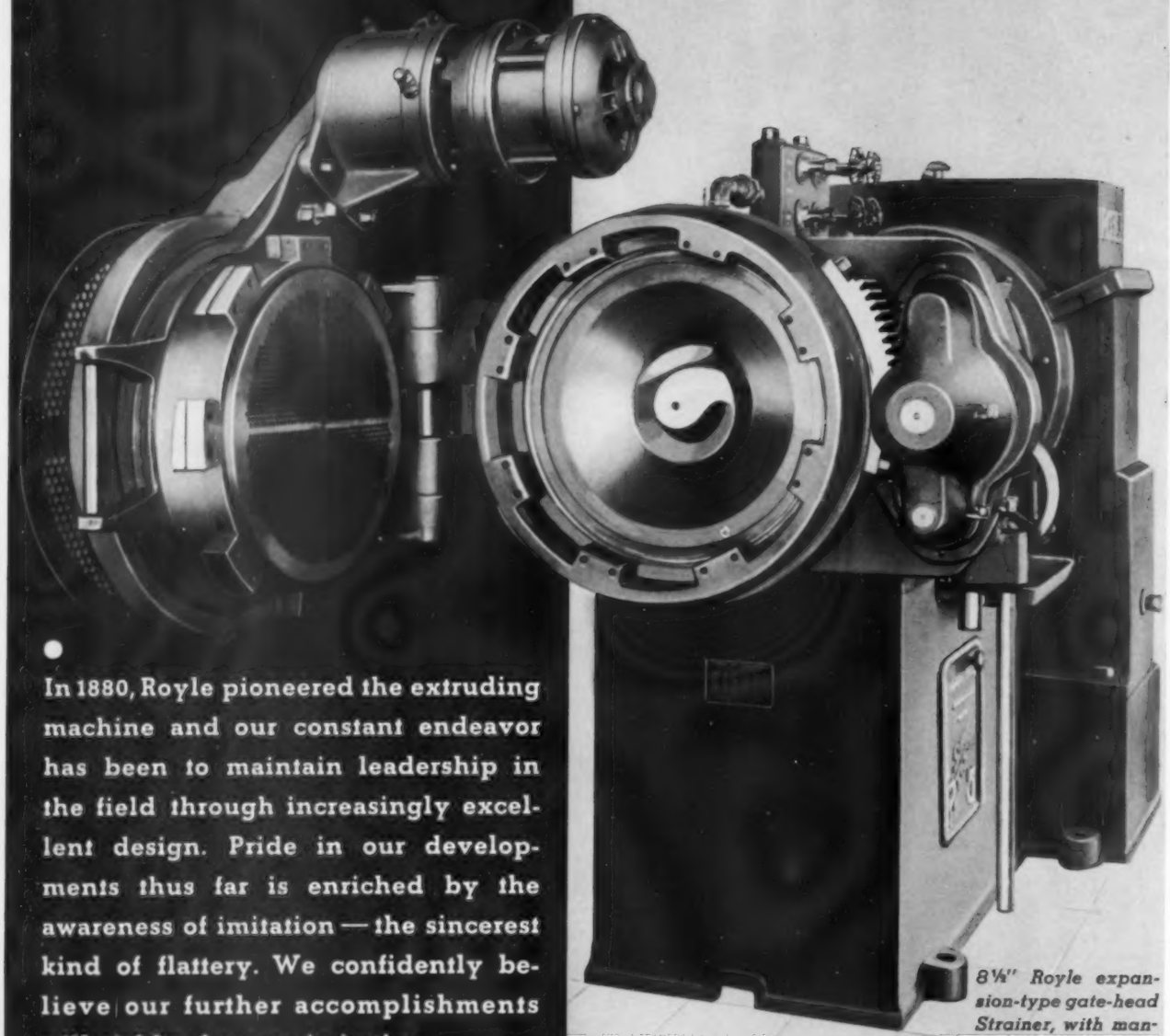

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The RUBBER AGE

VOL. 49, No. 4 JULY, 1941

A Method for the Testing of Adhesive Tape[1]

By WILLIAM C. GEER[2] and W. BURTON WESCOTT[3]

IN the course of a study in the laboratory of the senior author, at Ithaca, N. Y., of pressure-sensitive adhesives, the authors became convinced that none of the generally accepted methods for the testing of insulating tapes was accurate enough to be a reliable measure of the quality of masking tapes. The appended references are to those more recently published articles which describe methods in current use for the testing of rubber tape and are included here merely for the sake of completeness. In our studies, the very irregular results which we found seemed to reside partly in how the test specimens were prepared and partly in the apparatus used. After a long examination into the requirements, it became clear that accuracy could be obtained only by the use of apparatus which was designed specifically for the purpose of these tests and by the application of precise manipulative methods.

The purpose of this paper is to present a brief description of the apparatus and the methods used, in the hope that it may be of interest not only to those who test masking tape, but also in the field of testing of rubber insulating tapes. The specific materials tested under these procedures were cloth-backed industrial adhesive tape and paper-backed masking tape. They were received in rolls 1 in. wide and 50 ft. in length. The adhesives tested were pressure sensitive ones containing rubber as the basic ingredient. The room in which the tests were performed was small and, by means of an air-conditioning unit designed for this room, the temperature was maintained at 70° ± 2°F. throughout the 2 years of the study. The humidity was also controlled at 55 ± 5 per cent.

Materials Used

For certain of the tests strips of sheet steel, 2 by 8 by 0.019 in., were used. Each metal strip was gaged with a micrometer in six places and any which varied more than 0.001 in. were rejected. They were then lacquered with Duco lacquer and polished by a professional finisher of automobile bodies. The lacquered strips were cleaned by swabbing with 1-in. squares of surgical cotton dipped in chemically pure carbon tetrachloride. The cotton was manipulated with forceps, so that at no time was it touched by hand. The metal strips at all times were handled by the edges. After cleaning, they were lightly brushed with a clean piece of bleached muslin to remove fibers left from the cotton. No cotton or muslin pieces were reused.

To set up these metal strips for application of the tape, two of them, held by the edges, were placed on the ruled board of the tape cutter, Fig. 2, and marked with red pencil along one side of the strip at 1, 2, and 6 in. from the right hand end. They were then set in position on the surface plate, *H*, of Fig. 1. At each end of these strips, fastened to the surface with tape, was a blank half strip of lacquered metal to maintain a constant level for the roller throughout its journey across the surface plate. The rolling machine was thus made ready for the tape. This machine is described later.

To prepare the tape samples, a roll of tape was

[1] This paper was presented at the 44th Annual Meeting of the American Society for Testing Materials, Chicago, Ill., June 23-27, 1941. This is its first publication.

[2] Formerly vice-president in charge of research and development for the B. F. Goodrich Co.; now engaged in private research at Ithaca, N. Y.

[3] Consulting chemist, Dover, Mass.

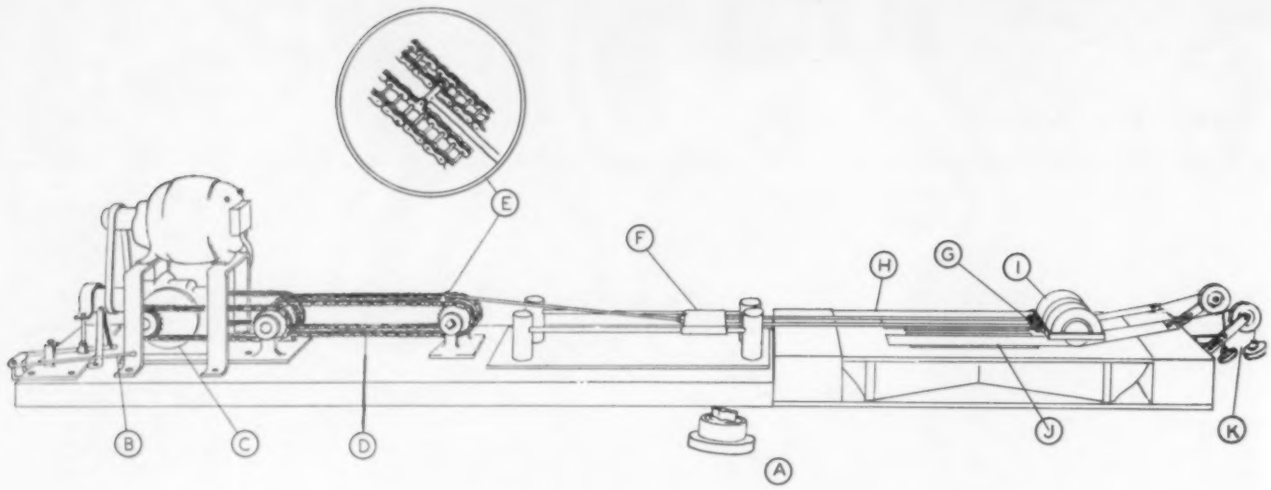


FIG. 1—Rolling Machine.

placed on the spool of the tape cutter, Fig. 2, so that the tape could be unrolled with the backing side down. Six feet of tape were cut from the roll and rejected. The balance of the roll was then ready for immediate use. Mounting blocks, shown in Figs. 2 and 3, are provided to insure attachment of tabs without contamination of the tape samples.

A paper tab, 1 by 7¼ in., provided with a strip of aluminum 1 by ⅜ in. pierced by a 3/16-in. hole fastened at one end of the paper tab by means of a small piece of industrial tape, was set on the mounting block. A 13-in. strip of tape was cut from the roll, using the tape cutter, Fig. 2, the tape being removed from the roll at the rate of 6 in. per sec. It is important to observe this exact rate. The test piece of tape was picked up by the ends, turned adhesive side down, held free from any contacts until the 4 in. of tape at the right end of the strip were fastened to the paper tab. The specimen with attached tab was removed to the surface plate and 1 in. at the left end of the tape was fastened to one of the blank metal strips, across the division, and to the left end of the corresponding test metal strip. By means of a hook and cord passed over a pulley, a 100-g. weight was fastened to the tab at the right end of the tape, see Fig. 3. The samples were then ready for rolling into contact with the lacquered metal.

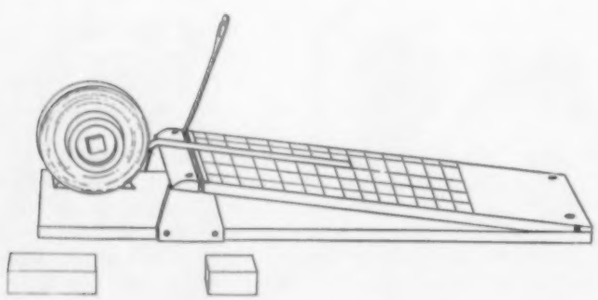


FIG. 2—Tape Cutter and Blocks.

Rolling Machine

It was found by long and careful experiment, that the measured adhesion shown by a given roll of tape varied greatly when the tape specimen was applied to the metal strip by other than precise methods. The purpose of the rolling machine was to roll down the tape samples upon the lacquered metal strips uniformly so that each tape sample was applied to its particular strip under exactly duplicated conditions as to time and pressure.

The rolling machine consisted of three basic parts: (1) a surface plate, (2) the roller with its frame and weights, and (3) the chain drive for the roller. The surface plate had the usual accuracy of flatness to be expected from such an article. This was tested by means of a spherometer, and the one used was found to conform to high accurate uniformity of flatness of surface. The roller consisted of a steel cylinder 2 in. in diameter by 8 in. long, mounted in a frame upon which were two lead weights arranged to be moved by a motor and chain mechanism at a uniform rate of 4½ in. per sec. to and fro across the 9 by 14-in. surface plate. The roller and lead weights together gave a load of 8½ lb. per inch width of tape. The roller was turned, ground, and polished with an accuracy equal to that of the surface plate. It was then chromium plated and regaged.

Reference to Fig. 1 will show the relations of the several parts of the rolling machine. *(A)* is the main switch, *(H)* the surface plate, and *(I)* the roller with frame and weights. It will be observed that two test specimens are rolled simultaneously, although one may be a dummy. This is necessary in the interest of uniformity because no scheme of rolling a tape as narrow as 1 in. wide will give a uniform distribution of weight. Even with rolling two at once, a necessary feature of the mechanism is a two-directional joint *G* which permits the roller to move over irregularities in a direction perpendicular to the direction of travel of the roller and, also, in a direction at an angle to the plane of the surface plate. The necessity for this is that tape is highly

accurate as to thickness. The parallel rods and carrier *F* insure exactness of the horizontal direction of motion of the roller. Because uniformity of motion over the tape being rolled was found necessary due to the influence upon the adhesion of any dwell upon any given portion of the tape, a chain drive, *D*, for the roller mechanism was developed. *E* shows the attachment of the connecting rod to the chain; *B* is a brake which is necessary to stop the roller at a specific place; *C* is the speed reducer for the motor.

It is to be noted, from the arrangement of the test plates, tape weights, and pulleys, *J* and *K*, that the adhesive upon the tape at no time came in contact with the metal to which it was to be applied, until brought in contact with it by the motion of the roller. This is important. Figure 3 shows this condition more in detail. This shows the surface plate, roller, metal strips, and tape in position; also the blocks diagrammatically shown in Fig. 2 which are used to prevent contamination of the adhesive when applying the tape specimen to the tabs.

Two 13-in. strips of tape are cut, mounted on the tabs, and fastened in the outer position on the rolling machine in the manner already described. The two test pieces of tape, when ready to be rolled down on the lacquered metal strips, are set up as in Fig. 3. The roller passes lengthwise over the tape a total of six times, three times in one direction and three times in the opposite direction. By means of the brake, *B*, Fig. 1, the roller can be stopped in position off the metal strips at the left.

When the rolling is finished, the weights are unhooked from the tabs, and the tape and metal strips removed from the surface plate. The ½ in. of tape at the left which overlapped the blank metal strip is folded back and fastened to the underside of the lacquered metal strip. The strips are then set aside to stand for 15 min. before testing.

The Testing Machine

The stripping test machine is shown in Fig. 4. Essentially, the machine is an adaptation of a Scott yarn testing machine. Duplicate jaws were used so that two pieces of tape could be tested simultaneously. By means of reducing gears, the speed of the jaws is brought to 13 in. per min. The two jaws are attached on one threaded shaft driven by a reversible motor so that the jaws can be lowered during the test and raised to the original position after the test at the same rate (13 in. per min.).

The autographic record is drawn on a chart fastened to the drum of a Phipps & Bird Kymograph, the drum of which revolves at the rate of 4 in. per min. The rate of rotation of the Kymograph is not pertinent, although the speed selected was that which would show a reasonable relation to the actual amount of tape stripped from the metal. In practical use, the speed might be greater or less at the desire of the operator. Thus, he could show upon a given chart fewer or more individual tests.

In order to measure the adhesion it was found, after much study, that a push-pull spring balance was the most accurate and most satisfactory means of applying the load. They were made by Chatillon to special design. A light-weight holding device was attached in place of the usual pointer. This carried an arm of spring steel and a pen, light enough in weight so as to be well within the load tolerance of the spring balance. The spring balance was fixed upon a bracket and positioned such that the pull would be exactly vertical. Spring balances of the customary friction-bearing type were wholly unreliable. Therefore, the ones used were made with ball bearings at top and bottom and even these needed to be adjusted with extreme accuracy and the axis of the rod through the balance was made to pass through the exact center of each of the ball bearings. The balances were calibrated frequently by dead weights. Typical calibration charts, taken both by addition and reduction of load, are shown in Fig. 6.

The charts used for these tests were 6 by 20-in. pieces of thin semi-transparent paper on which horizontal lines corresponded exactly with the scale markings on the balance. For the 18-oz. balance the chart was ruled in ounces. For the 5-lb. and 10-lb. balances the chart was ruled in quarter and half pounds respectively, the same chart having been used for either balance. Along the bottom of the charts were spaces for the usual records.

The actual method for performance of the test is as follows:

After the tape is rolled on the metal strip, it remains undisturbed for 15 min. ± 10 sec. Then the tab of the test piece is doubled back over the tape,

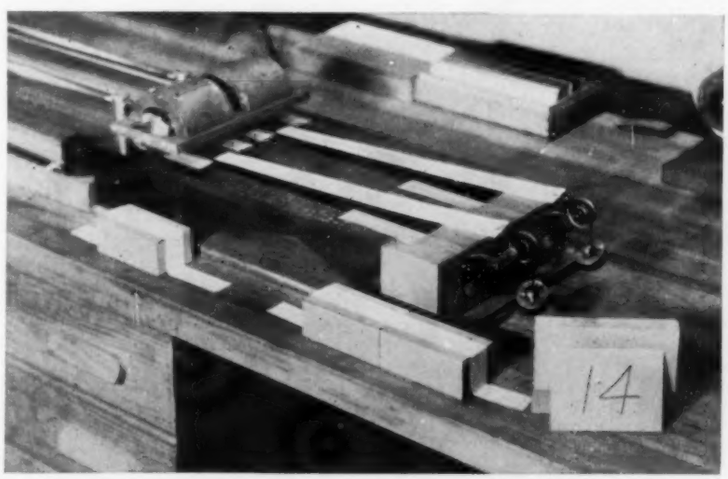


FIG. 3—
Roller Ready for Use.

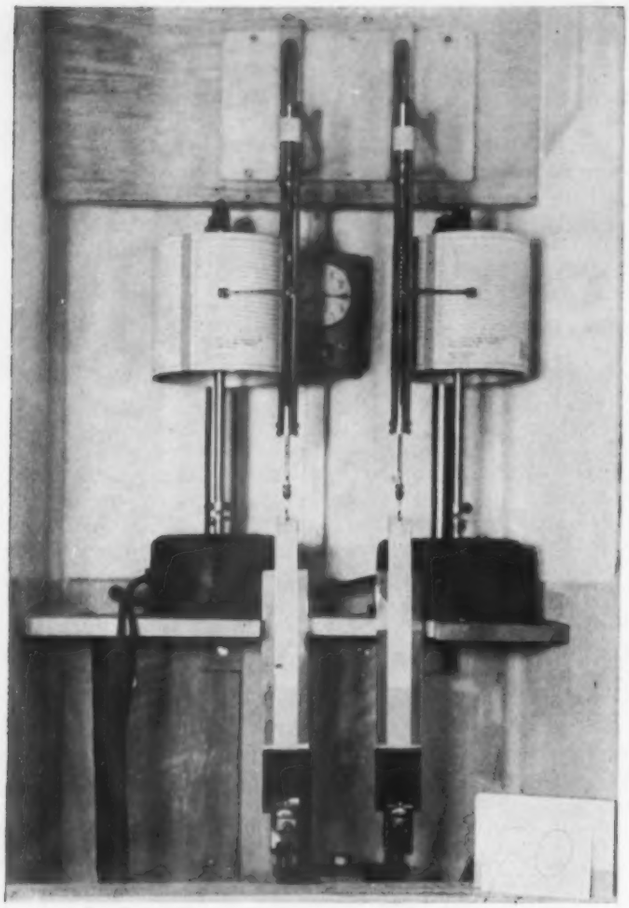


FIG. 4—Push-Pull Spring Balance.

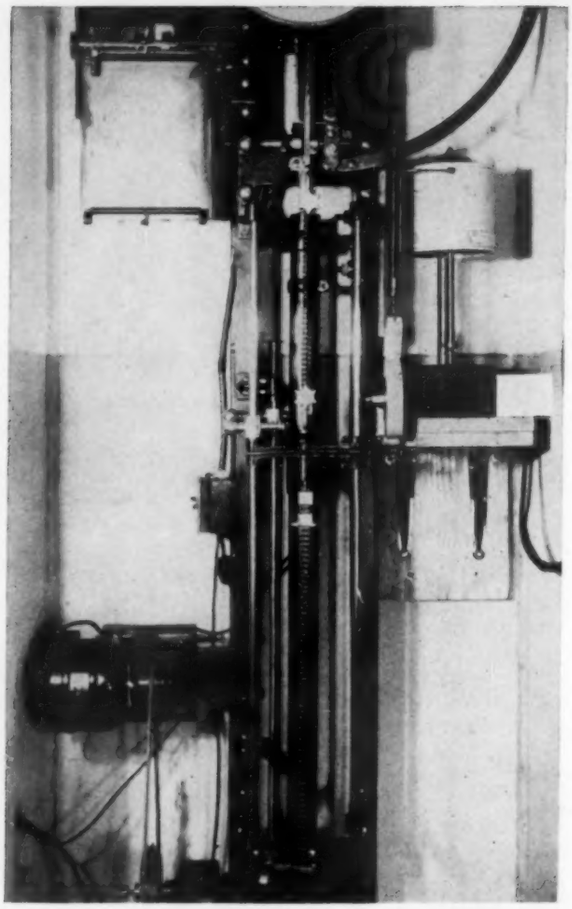


FIG. 5—Test Adaptation to Scott Machine.

and the tape stripped by hand up to the first red mark 1 in. from the right end of the metal strip. The end of the metal strip thus uncovered is clamped in the jaw of the testing machine so that the strip is in a vertical position, the tab having been lined up directly in front of the tape. The hole in the upper end of the tab is slipped over a hook at the lower end of the spring balance. Every motion of the operator must be timed in order to duplicate the set-up for each test.

The other test piece is set in position under the second spring balance. When the tape is stripped from the metal piece, the rough paper or cloth backing of the specimen which is still on the metal may rub against the back of the part already being pulled off. The friction thus induced may cause errors in the record. To avoid this, a piece of waxed paper 2 by 8 in. is placed between the tab and the tape. Thus, the rough back may rub against this waxed paper and experience showed that the errors due to friction were eliminated.

The chart is adjusted to zero, and the drum rotated to give a ½-in. zero line. The drum is stopped, and the jaw started downward. The tape is allowed to strip up to the second red mark, 2 in. from the lower end of the lacquered metal strip. At this point the drum is started and an autographic curve of the force required to strip the tape from the lacquered metal is recorded.

When the tape has stripped to the third red mark, 6 in. from the lower end of the metal strip, the drum is stopped. This gives a curve which corresponds to 4 in. of stripping under uniform conditions. The jaw motion is reversed, the balance is allowed to return to zero, and a second ½ in. zero mark is recorded by running the drum for a short time. Thus, a record of accuracy of the spring balance and of the setting of the machine is recorded for each test made. The strips are then removed from the machine.

If reference is now made to any one of the records on Fig. 7, it will be seen that the vertical line indicates the increase of tension until the tape begins to strip from the lacquered metal. From then on, the line is irregular in a horizontal direction and shows the value of the adhesion between tape and lacquer.

In performing this test, rolling one pair of test pieces and stripping another pair which had remained undisturbed for 15 min. ± 10 sec. may be alternated so that the testing may be performed without delay through a given series of tape samples.

For measurements of other qualities of the tape such as the anchorage of the adhesive mass to the paper or cloth backing or the adhesion of the mass to the back a similar technique may be employed.

Stripping from the full roll was performed by the use of a Scott rubber testing machine, the jaw of which was modified by the addition of a metal cyl-

inder 1 in. wide and of such a diameter as to fit inside the cardboard spool of a roll of tape snugly enough to prevent the spool from slipping on the cylinder. The cylinder was mounted in such a way that it could be revolved freely on its axis; see Fig. 5.

The set-up consisted of a Chatillon push-pull spring balance and a Kymograph like those which have been described above. The jaw of the machine was lowered at the rate of 25½ in. per min.

Six feet of tape were cut from the roll and rejected. The roll was placed on the metal cylinder of the test machine so that when the tape was pulled upward from the roll, the back of the tape was toward the operator. A 5-in. length of tape was stripped from the roll. A metal tab 1¼ by 2¾ in. punched at one end, was fastened to the adhesive 1½ in. from the end of the tape, the punched end of the tab being toward the end of the tape. The 1½ in. end of the tape was folded over the tab and fastened.

A hole was punched in the tape coinciding with the hole in the tab. On the back of the tape on the tab was written the tape sample number and the roll number. At the juncture between the loose end of the tape and the roll, a red pencil mark was made both on the roll and on the back of the loose end of tape, thus marking off one complete revolution of the tape on the roll. The hole of the tab was slipped over the hook on the bottom of the spring balance.

The chart was adjusted to zero and the drum rotated to give a ½ in. zero line. The drum was stopped and the jaw started downward. As soon as stripping began, the drum was started and an autographic curve of the force required to strip the tape from the roll was recorded.

When the tape had been stripped to the second red mark, that is, one complete revolution of the roll, the drum was stopped. The jaw was raised, the balance was allowed to return to zero, and a second ½ in. zero mark recorded by running the drum for a short time. The test piece was cut from the roll and the tab removed. In performing this test, one roll was prepared and tested at a time.

Results

A very large number of tests were performed upon metal strips lacquered with Duco and other types of automobile finishes. Surfaces such as spring steel, cold-rolled steel, chromium plate, glass, and others were studied. Also the effect of roughening the surface with sandpaper and the effect of different methods of cleaning the strips were tested. A discussion of these variables, however, would require an inordinate amount of space. Therefore, only certain

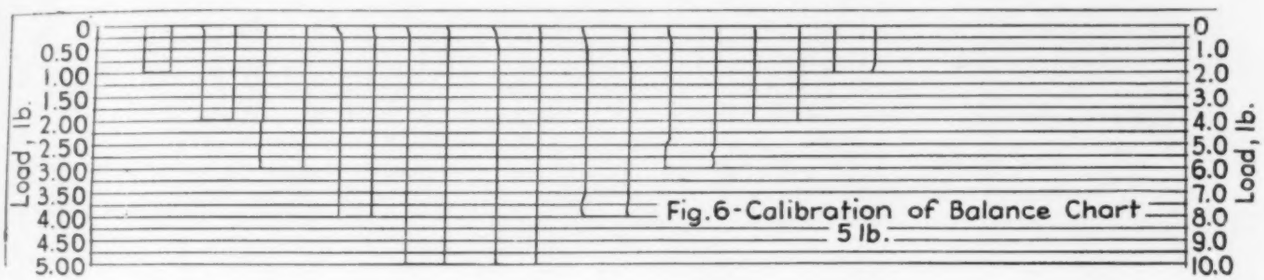


Fig. 6- Calibration of Balance Chart — 5 lb.

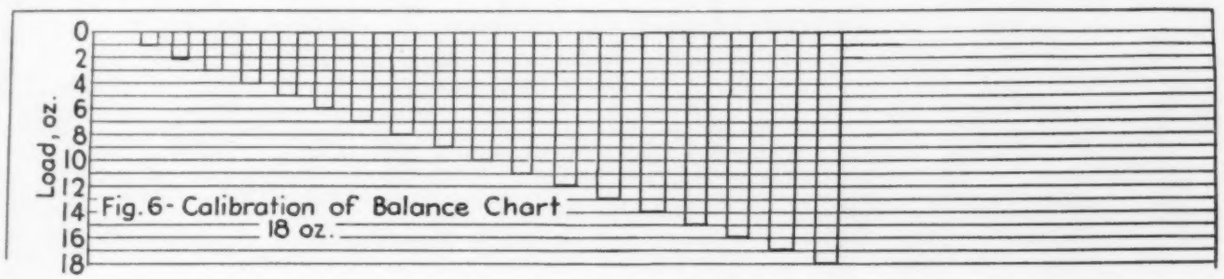


Fig. 6- Calibration of Balance Chart — 18 oz.

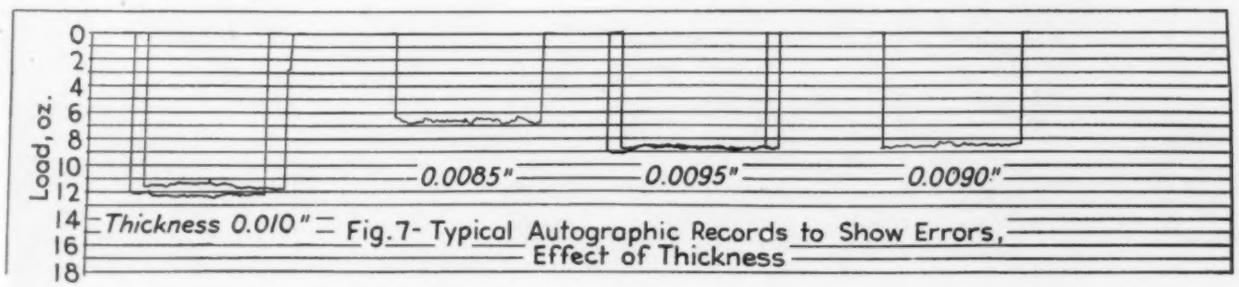


Fig. 7- Typical Autographic Records to Show Errors, Effect of Thickness

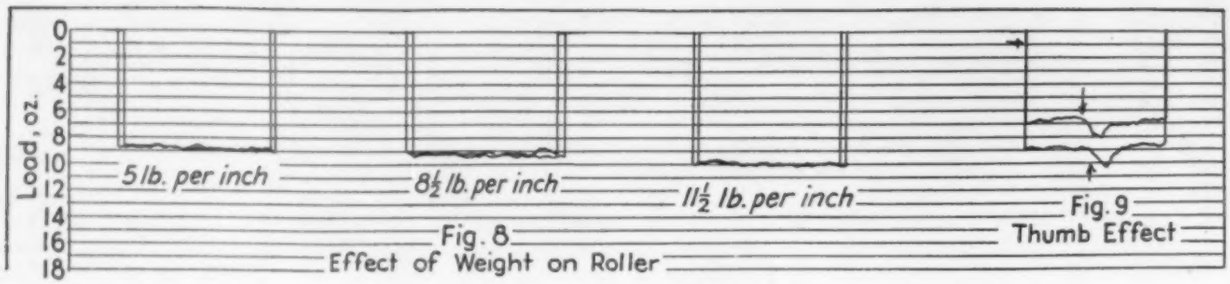


Fig. 8
Effect of Weight on Roller

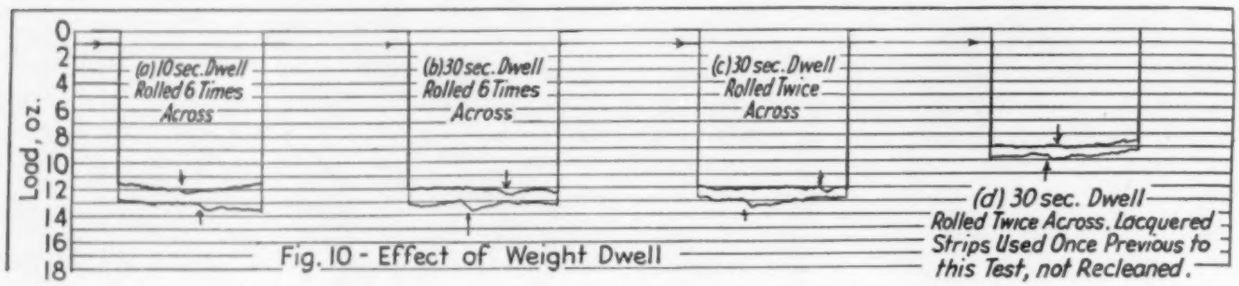
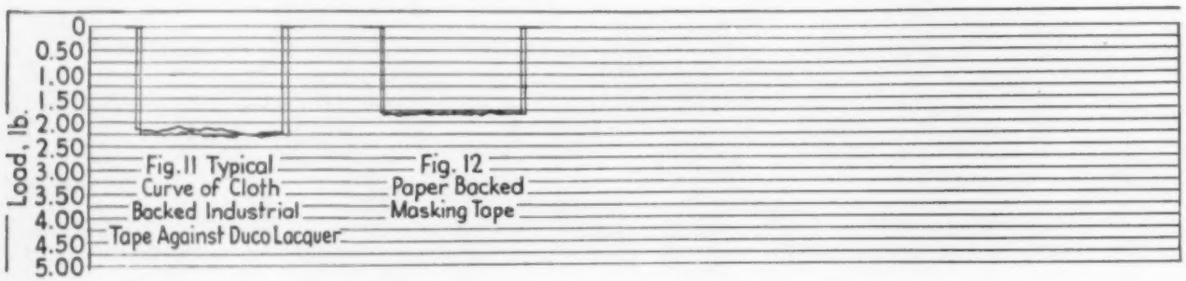
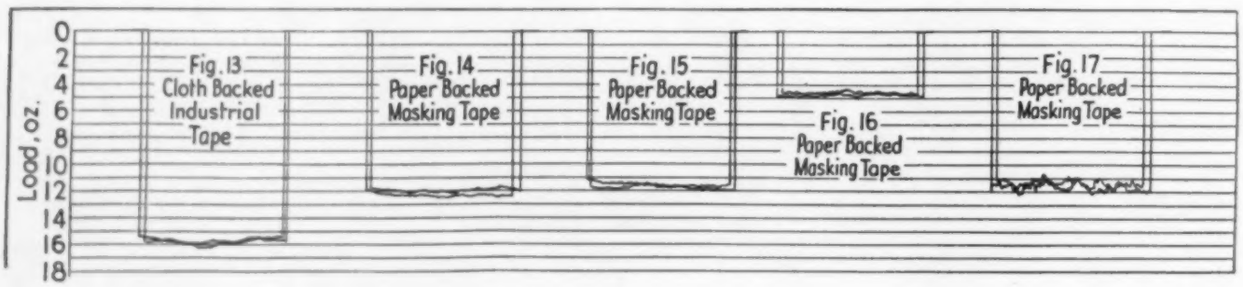


Fig. 10 - Effect of Weight Dwell





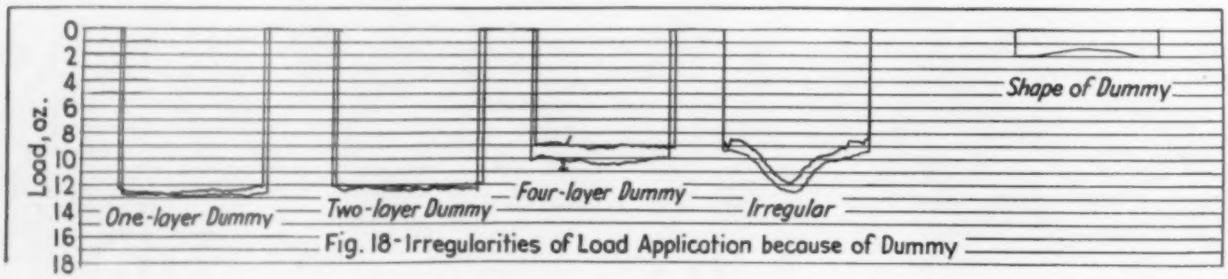


Fig. 18 - Irregularities of Load Application because of Dummy

results with adhesion to lacquered metal have been reproduced. These have been selected to illustrate not only typical curves, but also to show the effect of some factors which influenced the adhesion to the most pronounced degree.

Figure 7 shows records in which the effect of the thickness of paper-backed masking tape against a Duco lacquer metal strip is recorded. The paper itself was 0.007 in. thick so that the thickness of the adhesive may readily be calculated. The thicker the adhesive mass, the higher the adhesion.

The weight upon the roller was varied and the effect is shown in Fig. 8. In this instance, the heavier the weight, the higher the adhesion. In the case of masking tape which was known to be irregular of face, this merely means that there was a larger area of contact of the adhesive to the lacquer.

Figure 9 is interesting in that these two tape samples were rolled not with the roller, but by the usual method of rubbing them down with the thumb. The irregularities are not only over the entire distance of stripping, but also the higher adhesion when the thumb was allowed to dwell for an appreciable length of time upon part of the tape.

Figure 10 shows the effect of dwell; namely, stopping the roller at a specific point upon each of the samples tested, as is shown, for 10 sec. in one instance and 30 sec. in others. It was results of this sort which influenced the design of the rolling machine, Fig. 1, for it proved the necessity of uniformity of application of load from end to end of the strip.

Figure 10*(d)* indicates also how the adhesion is reduced by minor impurities upon the surface of the lacquer. In this particular instance, the lacquered strips had been previously used but had not been recleaned.

Figure 18 demonstrates the influence of irregularities of load application. Such tests as these afforded evidence which led to the procedure of always rolling two strips of tape simultaneously, and these two strips of tape being from the same roll and applied upon lacquered metal strips of accurately gaged and identical thickness.

To insure uniformity of pressure of the roller over the tape width two specimens are always rolled at the same time. In Fig. 18, the word "dummy" is used merely to indicate that one or more layers of masking tape were used upon lacquered metal strips in place of a regular strip of tape made up for test. Thus, if the dummy were of one layer only, we get the first curve at the left. When of two layers, the adhesion is somewhat less although the duplicates are somewhat irregular. When in 4 layers, the adhesion and the duplicates are not only less, but differ from each other. When a dummy or any strip of tape is used the thickness of which is greater or less than that of the test specimen, the roller rides at an angle on the test specimen. The pressure, therefore, is not uniform over the width of the tape under test and the curve does not record a true measure of the adhesion. In the case of the fourth curve, a specifically irregular dummy was cut to the shape shown, with the result that the adhesion curve shows somewhat the inverse shape of the dummy.

Because this paper primarily is a description of method and apparatus, only a few copies of curves drawn by tape tested under these conditions are included. The figures mentioned in the following paragraphs are copies of curves selected from a very large number. The discussion of them is necessarily brief.

Drawn on the 5-lb. scale, Figs. 11 and 12 are curves of cloth-backed industrial tape and paper backed masking tape.

Figures 13 to 17 are records of adhesives against Duco lacquered metal strips. The chart and spring balance used were of the 18-oz. scale. The kind of backing is indicated on each figure.

Figure 13 is a standard cloth-backed industrial tape, although it was spread with a different adhesive than that shown in Fig. 11.

Compare Figs. 13, 15, and 17, which show not only the number of ounces of pull required to strip these tapes, but also the uniformity or the irregularity of the curves. When the thickness was the same, we found that each adhesive drew a characteristic curve.

Of particular interest to the authors was a long series of tests of paper-backed adhesive masking tapes after they had been run under specific and uniform conditions of aging. Some rolls were aged in a dry oven and others in a humid oven. By the application of these methods and apparatus, it was possible to appraise the expected life of tapes of different construction and which used adhesives of different compositions.

Conclusions

The authors performed several thousand tests upon adhesives of different compositions, manufactured under excellent controlled factory conditions and carried upon backs of a variety of constructions. One conclusion was clear, which is included here even though this particular paper is devoted largely to a description of the test procedure alone. This is that other things being the same (paper or cloth of the same construction, methods of manufacture, and so on) each adhesive, when tested as described, gives a curve which is characteristic of its composition.

Acknowledgements:

The authors wish to acknowledge the cooperation of Anthony Hunt, who was an assistant in the laboratory and who performed by far the majority of the tests. We would like to thank the officials of Johnson & Johnson, of New Brunswick, N. J., for whom the work was done, not only for their uniform cooperation, but for permission to publish this paper.

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Up-River Fine Para *versus* Plantation Rubber

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THE Okonite Company has used wild up-river fine Para rubber in electrical insulation for wires and cables for many years. Our experience shows that Para yields rubber insulation with superior properties. The advantages of this rubber and the disadvantages of plantation rubber are recognized by outstanding rubber chemists and technologists throughout the world. We have found it worthwhile to search the scientific literature pertaining to rubber and to present notable examples of evidence in support of our conclusion to regard up-river fine Para as the best quality and most uniform grade of natural rubber.

This survey of the literature has yielded two distinct classes of results relating to the subject: (A) the voluminous papers exposing the wide and uncontrollable variability of plantation rubber, and (B) the experience and views of many authorities which support the wide belief in the superiority of fine Para.

In the early days of the rubber industry the supply of raw rubber came from the Amazon Valley through the port of Para; thus the name Para rubber. The most expensive and the highest quality came from the headwaters of the Amazon River and was known in general by the name of Fine Up-River Para. In spite of heavy penalties imposed by the Brazilian Government, the seedlings of rubber trees were exported from the Amazon Valley and put on plantations, principally in the Far East. This plantation rubber now far exceeds in *quantity* the rubber coming from the Amazon Valley.

Slicing Para rubber, which still arrives in the form of coagulated biscuits.

The Okonite Company and many authorities in the field of rubber technology have never been convinced that plantation rubber equals in *quality* the wild and native Amazon rubber, even though it may be obtained from the same species of rubber trees *(Hevea brasiliensis)*. Some of the reasons for this will be presented further on in this discussion. While the market prices of raw rubber fluctuate considerably, it is interesting to note that the cost of washed and dried up-river fine Para rubber is almost invariably higher than that of the best plantation grades.

Although it is seldom good policy to use quantity as a criterion for quality, it might not be understandable, at first glance, why wild rubber (including the best available quality rubber) consumption is so small compared with plantation rubber. A few comparative statistics easily explains this. In 1939 the world's supply of raw rubber included only 3 per cent of wild rubber, of which only a fraction was up-river fine Para *(1)*. However, a comparison of rubber consumption in the United States by principal products in 1937 *(2)* shows that the manufacture of automobile tires, inner tubes, mechanical rubber goods, boots and shoes, etc., consumed the greater part of the rubber used, whereas the wire and cable industry's consumption was only a fraction of the 3.65% of the total consumption which was listed for miscellaneous rubber products.

Furthermore, the life expectancy of the former group of products is limited and permanency may not be so essential, but the length and service of high-grade wire and cable insulation is desired to be almost indefinite; therefore, since the ultimate electrical tests on the finished cable and the many, many years of satisfactory service are such a delicate criterion of excellence, nothing short of absolute purity, cleanliness and uniformity should be aimed at.

Plantation rubber first appeared on the market about 1900. In 1914, at the Fourth International Rubber Conference, held in London, Williams, in an appeal to plantation rubber producers, stated that, "average plantation rubber as turned out today is not equal to Para in uniformity of strength" *(3)*. At that time planta-

tion rubber represented 45% of the world's total; 24 years later, in 1938, it amounted to 97% of the total.

Hastings and Rhodes, of the Rubber Research Institute of Malaya, pointed out in 1939 that ever since the appearance of plantation rubber in quantity it has given difficulty in handling on different consignments and that, although it had almost replaced Para, Williams' observations are equally applicable today *(4)*. The experimental work leading to these conclusions will be presented later in this discussion.

Among the many studies published on suggested methods of testing for the variability and evaluation of raw plantation rubber is one by Martin *(5)*. In this work, Martin discusses the limitations of laboratory test methods and offers a system for the grading of raw rubber. He admits, however, that long periods of natural aging would produce the most reliable results. Dinsmore, of Goodyear, has expressed similar views in a paper on laboratory testing and its relation to service *(6)*. In the same year, 1932, Bishop and Fullerton published the results of their experimental work which showed the wide variations in plantation rubber as regards vulcanization properties, modulus and plasticity *(7)*. Later, G. A. Sackett, also of Goodyear, reported on the variations in the rate of cure of different stocks made with raw plantation rubber *(8)*.

At the Rubber Technology Conference in London in 1938, Haywood showed by the results of his experiments that variation which is apparent in raw rubber is still apparent in the finished article *(9)*. A. Van Rossem, one of the world's leading authorities on rubber, concludes a discussion of the literature (which included 18 references) on the variation of Hevea plantation rubber by stating that, in his mind, there is no doubt that variations may be reduced to limits, but that it would be wrong and beyond hope to believe that the plantation industry as a whole will be able to produce a strictly uniform first latex plantation rubber *(10)*.

The excellent work of Hastings and Rhodes published in 1939 *(4)* furnishes new experimental data on the variability of plantation rubber. These investigators tested samples of No. 1 Smoked Sheet from 157 different locations. All samples were collected on the same day to eliminate seasonal effects. The modulus of elasticity at 800% elongation of rubber-sulfur vulcanizates and at 700% elongation for the rubber samples vulcanized with accelerators (the recommended recipe of the Division of Rubber Chemistry, A.C.S.) was measured. Although these two methods could not be correlated directly, in no case was there a reversal of the grading of the quality of any sample. The values obtained by the first method ranged from less than 490 to 2,129 lbs./sq. in. and in the second from less than 490 to 1,416 lbs./sq. in.

The results definitely indicate that the controllable variations due to producers (tapping, coagulating, rolling, smoking, washing, drying, etc.) do not cause as great a variation in the rubber as supposed. The variability is largely a result of inherent variations in the latex, including differences in trees, soil and other environmental conditions. The authors conclude by stating that the necessity for blending, as pointed out by Sackett in 1934 *(8)*, is still warranted.

Although blending is desirable this does not necessarily mean that the problem is solved; the poor quality rubber is still in the blend and ultimately has its effect as such. It has been proved by innumerable experimentations with rubber and synthetic high polymers of similar nature that a substance whose integral parts (molecules, micelles, agglomerations) represent a wide distribution of physical and chemical properties (such as blended plantation rubber) and a substance having a narrow range of distribution (such as is undoubtedly the case with up-river fine Para rubber), although the two may seem very similar, judging from less comprehensive tests *(e.g.,* tensile strength at one or two different elongations and at rupture), they are actually very different in many physical and chemical properties. The details of such experiments are very complex and far beyond the scope of this discussion.

Wild up-river fine Para undergoes thorough washing, as seen here, before being used.

The Crude Rubber Committee of the Division of Rubber Chemistry of the American Chemical Society has sponsored many extensive investigations of the variability and testing of raw plantation rubber. The most recent report *(11)*, published in 1940, gives the results of 16,981 tests carried out in various laboratories on samples of smoked sheets. The modulus at 700% elongation of the vulcanizates (A.C.S. recipe) varied from 850 to 2,200 lbs./sq. in.

In 1922, at the convention of the International Association of Municipal Electricians, it was stated that plantation and fine Para rubbers are equal *(12)*, but no supporting data was presented. This is in direct disagreement, however, with views expressed before and since that date. Beaver, in his book, "Insulated Electric Cables," published in 1926 *(13)*, stated that, "plantation rubber . . . closely resembles, but hardly equals—so far as certain technical results are concerned—the hard fine Para rubber produced by natives in South America." An article appearing in the *Vanderbilt News* in 1934 *(14)* included the statement, "a good many hold fine Para as the best rubber for certain high-grade specialties."

Dr. Hauser, now at the Massachusetts Institute of Technology, discussed future problems in rubber back

in 1935 *(15)* and, in that discussion, made the following statement: "We can broaden our knowledge by comparing the properties of original Para rubber, plantation rubber, and synthetic rubber—for example, higher tensile strength, higher abrasion resistance in Para and synthetic rubbers as compared with plantation rubber cured in the absence of accelerators, higher resistance to solvents and oils, tougher stock to start with, better aging." Some time later *(16)* Dr. Hauser repeated his opinion that in a number of respects present-day plantation rubber is not comparable to good wild-grown Para rubber.

It may very well be that one of the main reasons for some of the advantages of up-river fine Para rubber over plantation rubber is due to the fact that the former is taken from trees which have undergone a natural selection and, furthermore, is undoubtedly of a purer strain of the original *Hevea brasiliensis* trees than the stock of the plantation rubber trees. There is reason to suppose that the main difference is the age of the tree, since the Brazilian rubber is derived from trees of comparatively high age (30 to 40 years or over), whereas plantation rubber is obtained from trees ranging from seven years upwards. The experience and observations of many in the rubber industry over a period of years corroborates these views *(14, 17)*. It has been said that high-grade specialties requiring uniformity of physical characteristics in service and superior service performance is obtained with fine Para rubber only.

In a recent discussion pertaining to the Brazilian rubber industry *(18)*, it is pointed out that the production of rubber in Brazil has been increasing steadily, although its percentage of annual world consumption has decreased. Here, too, it is stated that Brazilian rubber is well known for having certain advantages when compared with plantation rubber and that the lack of certain qualities in plantation rubber has been the subject of study of various authors.

Washed Para rubber, like crude, is hung for long natural and unhurried drying.

This immersion test for wire or cable instantly detects any minute defects.

In summation, this survey of the literature has revealed the following facts: (1) There is a decided and proved variation in all plantation rubbers; (2) The probability of ever obtaining a strictly uniform plantation rubber is held by some to be beyond hope; (3) The uniformity, better aging, and superior performance in service of up-river fine Para rubber is recognized by many rubber authorities and has been demonstrated during many years of service. There is no question that Para rubber is essential in high-grade electrical insulation for wires and cables.

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Rubber Relief Maps

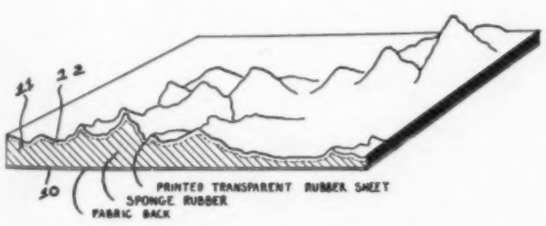
By B. SCHLEMMER

Staff Correspondent

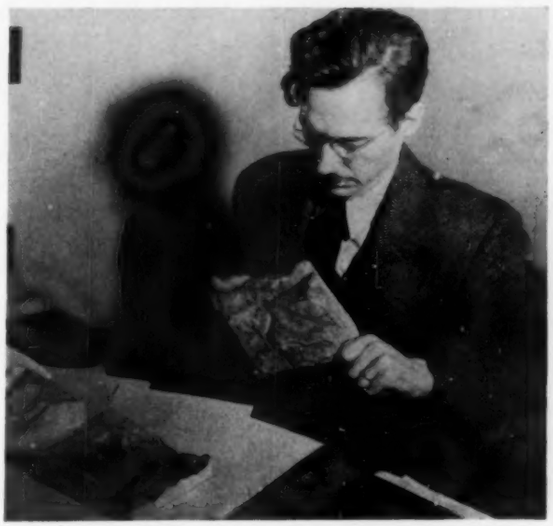
SOME time ago, Herbert R. Jensen of the University of Minnesota's visual education department, visited the Nebraska state capitol at Lincoln. In a 15-minute study of a big relief map he learned more about Nebraska geography than he could have learned in hours of reading. He wondered why more relief maps were not being used in geography teaching, and a brief investigation disclosed that the reason lay in the fact that the conventional plaster-of-paris maps presented difficulties—they must be made individually by hand, are highly breakable, and too heavy to be readily portable. The answer, he felt, lay in flexible relief maps and accordingly he applied himself to the problem, with rubber as the flexible material.

After a few years of trial-and-error experimenting, Mr. Jensen finally has come across what he believes to be a simple process for the manufacture of rubber relief maps, utilizing sheet rubber and whipped latex. The practice in building a plaster relief map is to build elevations as indicated by government-furnished flat contour maps with pins. Ranging in length from one-half to three inches, these pins are inserted close together so that their heads form a continuous raised surface, corresponding to the elevations indicated on the flat contour map. Plaster-of-paris is then poured over the pin structure to form the relief model.

In an effort to minimize the painstaking labor thus entailed, Mr. Jensen worked out a system for translating the vertical distance represented by plane contour maps into actual vertical representation on relief maps. This is done by projecting the plane contour map to the size desired upon a series of vari-colored wax sheets each of which has been rolled to identical thickness. Each layer of this wax "sandwich" is of a different color, and represents an elevation comparable to that indicated by concentric lines on the flat contour map which is to be reproduced in relief. Then, according to the shadows cast on the wax by the projected map, the layers of wax are cut away, one by one, in either graduated or vertical slices to correspond with projected topographical variations.



Construction of the map is indicated in this drawing from the patent.



H. R. Jensen, inventor, is seen here demonstrating the map's flexibility.

After the wax model is completed a plaster cast is made in the usual manner, this cast forming the pattern for an aluminum casting which serves as a mold for latex. All printed matter and color work, which is painted by hand on the usual plaster maps, is then drawn and lettered in reverse on the back of a sheet of thin, semi-transparent rubber which is stretched over the aluminum mold. Since rubber stretches in a linear relationship, and it is possible to calculate the distortion, the rubber sheet is sufficiently distorted to allow for "stretch" when pressed into the aluminum relief mold.

To put it another way, the distortion is made to guarantee that the rivers, as an example, painted on the rubber sheet will flow in the valleys grooved in the aluminum mold. Coloring and lettering is put on the back of the rubber sheet so that the finished surface can be washed and cleaned without any of the boundaries disappearing in the process. These rubber sheets can be produced in fairly large quantities by a regular lithographic process, whereas plaster relief maps, with their hand-painted color and print work, must be produced singly.

Once the rubber sheet has been stretched over the aluminum mold, whipped latex is poured into the cavities. After vulcanization the finished map consists of sponge rubber relief adhered to the thin, semi-transparent rubber sheet which carries all colored and printed matter. Very little shrinkage is met with during

the vulcanization process, less than one-half of 1%, according to Mr. Jensen.

The sponge rubber relief maps made by this process are said to weigh approximately one-sixth as much as the plaster maps, in addition to being virtually indestructible. Further, they can be folded or rolled as readily as paper, making them easily portable. Versatile as they are flexible, these maps can be utilized in teaching to a much greater extent than the plaster maps. Figures like chessmen, with suction caps or pointed bases, can be applied to the rubber map, making graphic such areas as oil, wheat and cotton belts by representing them with a miniature cotton boll, ear of corn or tiny oil well.

It is also pointed out that white relief maps of rubber may be used for a picture screen upon which maps showing rain areas, population centers, boundary lines, ore deposits, and other geographical data may be projected. The making of globes is also included in the process worked out by Mr. Jensen. These globes take the form of shells, having bladders that can be blown up, with diameters from 2 to 20 feet. Further possibilities are visualized for the process by educators and teachers.

Some Data on Chicle and Jelutong

THE principal forms of latex employed in the manufacture of chewing gum are chicle and jelutong. At one time the essential gum base of chewing gum was provided almost entirely by chicle, but now the base consists of a mixture of chicle and other materials with similar properties as a rule. These materials, of which jelutong is the most important, are normally available at a lower price than chicle. Some interesting data on both chicle and jelutong, in the nature of a review, appeared in a recent issue of *Canadian Chemistry & Process Industries*, as follows:

Chicle or chicle gum is the coagulated latex of the sapodilla tree which is well known in tropical countries. The sapodilla is indigenous to Central America and appears to grow best on the calcareous soils of the Yucatan Peninsula. Although it has been estimated that there are at least one hundred million sapodilla trees in this great area, the tapable trees are usually widely dispersed, and their density is seldom more than one, two or three per acre.

On collection, the latex is taken to a camp; and when sufficient is available it is boiled in an open cauldron, with capacity of some 40 gallons, to reduce the water content. During boiling the latex must be stirred constantly, and when it has been concentrated to the point at which it will set on cooling, it is removed from the cauldron. The chicle is then placed on a piece of canvas which has been rubbed with soap to prevent sticking and kneaded into blocks which may weigh from 5 lb. to 25 lb., although blocks of about 20-25 lb. seem to be most common. Blocks are left to dry for two or three days and are then packed for export in bales or sacks which normally contain about 100 lbs.

Commercial supplies of chicle are almost exclusively derived from Mexico, Guatemala and British Honduras, in that order of importance. In 1939, imports into the United States, the principal user, were divided as follows: *Mexico*, 10,925,539 lbs.; *Guatemala*, 2,051,220 lbs.; *British Honduras*, 1,701,645 lbs.

Jelutong, or pontianak as it is sometimes called, is a coagulated latex of trees which occur in Malaya, Sarawak, the Netherlands East Indies and adjacent territories. The material has long been known to commerce and was formerly exploited as an inferior variety of rubber, though it could not compete successfully since the coagulum consists mainly of resin. In 1922 jelutong suddenly found an outlet in the production of chewing-gum base, in which application it is employed in admixture with other materials.

Various substances have been employed in the coagulation of jelutong. Formerly kerosene, to which had been added small quantities of alum and gypsum, was utilized in Malaya and Sarawak. Alum and gypsum are still largely used in the Netherlands East Indies, but the use of acetic, formic and phosphoric acid has been developed in Malaya. Phosphoric acid has the special advantage of precipitating any traces of iron in the latex as in soluble iron phosphates, and its use is now approved by manufacturers in North America.

Refining treatment involves reduction of the water content of jelutong by boiling. Unless carefully prepared, jelutong is liable to serious deterioration on storage, which may render the product valueless although external discoloration due to growth of fungi is reported to be relatively unimportant.

Jelutong production is largely undertaken by Chinese and a large proportion of the crop is marketed through Singapore where it is purchased by manufacturers' representatives.

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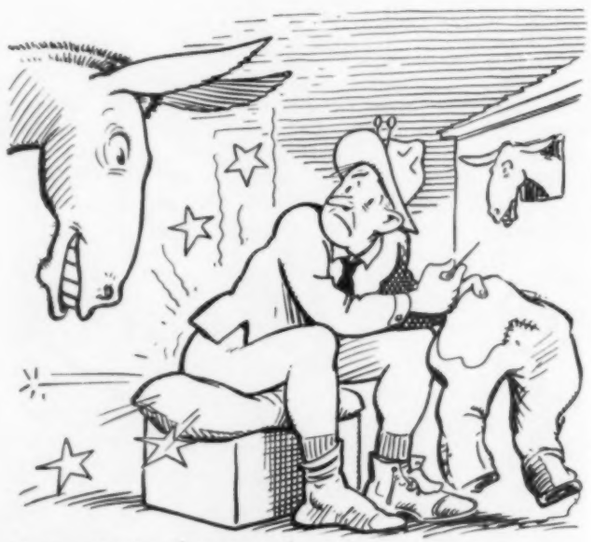

Hee-haw. Use HYCAR, Buddy.
It resists abrasion better.

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Terms of Rubber Control

General Preference Order No. M-15 to Conserve the Supply and Direct the Distribution of Rubber

Based on the Government's desire to accumulate a larger reserve of crude rubber for use under emergency conditions, and not because of any current lack of supplies, all rubber imported into the United States was placed on the preference list last month. On June 20, 1941, the Priorities Division of the Office of Production Management issued General Preference Order No. M-15 which covers the conservation of the supply and direction of the distribution of rubber, or, to put it another way, the rationing of rubber to manufacturers. Because of the direct importance of this order to every rubber manufacturer in the United States, we are publishing herewith the full text of the order.

WHEREAS, it is found that the uncertainty of future shipments of Rubber from abroad now seriously threatens the requirements of the National Defense Program for Rubber and products and materials of which Rubber is a component; and it is further found that the same may imperil the obtaining of priority for deliveries of such defense materials under present and future Army and Navy contracts and orders and related subcontracts and suborders unless the total present and future supply be conserved and the present and future use and distribution directed; and it is further found that the best interests of the national defense require the exercise of the power conferred upon me to direct and insure such priority; and

Now, therefore, it is hereby ordered:

940.1 GENERAL PREFERENCE ORDER

(a) Deliveries under Defense Orders, present and future, of Rubber, and products and materials of which Rubber is a component, by all Processors thereof shall be made in preference to deliveries under all other orders whenever and to the extent necessary to assure fulfillment of the delivery schedules provided in such Defense Orders or in any individual Preference Rating Certificates assigned thereto, whichever schedules be earlier.

(b) Deliveries under non-defense orders of Rubber, and products and materials of which Rubber is a component, by the Processors thereof may be made without limitation, except as otherwise specified in this Order.

(c)

(1) During each calendar month of the second half of the year 1941, each Processor of Rubber shall limit the total consumption or processing of Rubber, including that obtained from the Rubber Reserve Company, from his own inventory and from any other source, to an amount (hereinafter termed his "quota") not to exceed the following percentages of his average monthly consumption or processing of Rubber from all sources during the twelve months period commencing on April 1, 1940, and ending on March 31, 1941:

July	99%
August	94%
September	89%
October	84%
November	82%
December	80%

Provided, however, that a Processor who consumes or processes less than his quota in a particular month may add the amount so unconsumed or unprocessed to any subsequent quota or quotas.

(2) Commencing June 20, 1941, all Rubber then or thereafter released by the Rubber Reserve Company will be allocated by the Director of Priorities in accordance with the following provisions:

(i) For delivery to any person whose supplies on hand and on order are insufficient for his Defense Orders;

(ii) Where deemed necessary to expedite deliveries under Defense Orders and such result cannot be adequately obtained by use of preference ratings;

(iii) Any surplus remaining after fulfillment of the foregoing purposes may be allocated by the Director among non-defense orders.

(iv) Insofar as the Director of Priorities shall make allocations among competing civilian demands, the Director will be governed by the Civilian Allocation Program for Rubber issued or to be issued by the Office of Price Administration and Civilian Supply.

(d) Any Person who obtains a delivery of Rubber or products or materials of which Rubber is a component, under specific direction of the Director of Priorities or a delivery bearing a preference rating, must use the same, or an equivalent amount thereof, for the purpose specified in connection with the issuance of the direction or rating.

(e) No Processor shall discriminate against Defense Orders in the acceptance of contracts or orders for Rubber or products or materials of which Rubber is a component. When Defense Orders for Rubber, or products or materials of which Rubber is a component, are offered, they shall be accepted in preference to any other contracts or orders offered under substantially the same terms and conditions.

(f) When deliveries of Rubber, or products or materials of which Rubber is a component, have been unreasonably or improperly deferred by any Processor, or when orders therefor have been rejected (for any reason other than the restriction contained herein), the Person aggrieved may file with the Division of Priorities a verified report in form to be prescribed by the Division of Priorities, setting forth the facts in connection with such deferment or rejection.

Where the facts set forth justify such action, the Director of Priorities will thereupon direct the Processor against whom complaint is made to submit a sworn statement, setting forth in detail the circumstances concerning the alleged deferment of deliveries or rejection of the orders. Thereafter such action will be taken by the Director of Priorities as he deems appropriate.

(g) In addition to all other limitations and restrictions upon orders and deliveries contained herein, no Processor shall, after the effective date of this Order, knowingly make delivery of Rubber, and no Processor shall accept delivery thereof, in an amount or quantity which will increase for any current month the inventory of Rubber of the Processor accepting delivery, in the same or other forms, in excess of the amount or quantity necessary to meet required deliveries of the products of the Processor accepting delivery, on the basis of his current method and rate of operation. This provision shall not prohibit or restrict:

(i) Deliveries for direct export out of the United States, provided that such exports shall have been licensed by the Administrator of Export Control;
(ii) Deliveries of imported Rubber to any Processor importing the same, either directly or through an agent, under a contract which was in existence upon the effective date of this Order.

(h) All Processors affected by this Order shall keep and preserve for a period of not less than two years, accurate and complete records of their inventories of Rubber, and products and materials of which Rubber is a component, and of the details of all transactions in any way regulated or affected by this Order. Such records shall include the dates of all contracts or orders accepted, the delivery dates specified in such contracts or orders, and in any Preference Rating Certificates accompanying them, the dates of actual deliveries thereunder, description of the Rubber or products or material of which Rubber is a component covered by such contracts or orders, description of deliveries by classes, types, quantities, weights and values, the parties involved in each transaction, the preference ratings, if any, assigned to such contracts or orders or to deliveries thereunder, and other pertinent information. All records specified in this paragraph shall, upon request, be submitted to audit and inspection by duly authorized representatives of the Division of Priorities. All Processors affected by this Order shall execute and file with the Division of Priorities such reports and questionnaires as said Division shall from time to time request. No reports or questionnaires are to be filed by any Processor until forms therefor are prescribed by the Division of Priorities.

(i) Any Processor who wilfully falsifies the records referred to in paragraph (h) above, or any other records which he is required to keep by the Director of Priorities, or who otherwise wilfully furnishes false information to the Director of Priorities or to the Division of Priorities, and any Person who obtains a delivery or a preference rating for a delivery by means of a material and wilful misstatement, may be prohibited by the Director of Priorities from making or obtaining further deliveries of Rubber and products and materials of which Rubber is a component. The Director of Priorities may also take any other action deemed appropriate, including the making of a recommendation for prosecution under section 35 of the Criminal Code (18 U.S.C.A., section 80).

(j) Any Person affected by this Order who considers that compliance therewith would work an exceptional and unreasonable hardship upon him, may appeal to the Division of Priorities by addressing a letter to the Division of Priorities, Office of Production Management, Social Security Building, Washington, D. C., setting forth the pertinent facts and the reasons such person considers that he is entitled to relief. The Director of Priorities may thereupon take such action as he deems appropriate.

(k) Any Processor who is prohibited from, or restricted in, making deliveries of any Rubber or products or materials of which Rubber is a component, by the provisions of this Order shall, as soon as practicable, notify each of his regular customers of the requirements of this Order.

(l) For the purposes of this Order:
(1) "Rubber" means all forms and types of crude rubber.
(2) "Person" means and includes any individual, partnership, association, corporation or other form of business enterprise.
(3) "Processor" means any Person processing or consuming Rubber.
(4) "Defense Orders" means contracts or orders for material, unfinished, semi-finished, or finished which at any stage of production enters into the manufacture, processing, or fabrication of products to be delivered to, or for the account of

1. The Army or Navy of the United States, the United States Maritime Commission, the Panama Canal, the Coast and Geodetic Survey, the Coast Guard, the Civil Aeronautics Authority, or the National Advisory Commission for Aeronautics;
2. The Government of Great Britain;
3. The Government of any other country whose defense the President deems vital to the defense of the United States under the Act of March 11, 1941, entitled "An Act to Promote the Defense of the United States."
4. Any other Government agency or Person, whom the Division of Priorities shall have assigned a preference rating of A-10 or higher thereto.

(m) This Order shall take effect on the 20th day of June, 1941, and unless sooner terminated shall expire on the 31st day of December, 1941. This Order shall supersede as of the date hereof any special orders or directions for the delivery of any Rubber by the Director of Priorities.

Issued this 20th day of June, 1941.

E. R. Stettinius, Jr.
Director of Priorities

Editor's Note: Since issuance of the above order a supplement has been issued providing that no processor shall be required to reduce his rubber consumption during July by more than 20% of his June, 1941, figure.

Neoprene Type KN

NEOPRENE Type KN, recently introduced by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, is similar in appearance to Type G, its vulcanizates having properties essentially the same as those of similarly compounded stocks made from Type G or GN. It differs from the other types, however, in that the polymer can be plasticized to a much greater extent by use of the same chemical plasticizers used with Type GN.

The new type of neoprene, according to the manufacturer, is of particular interest in heavily loaded compounds, base compounds for cements, compounds containing other types of neoprene, and compounds to be cast in special molds. Plasticity data indicates that Type KN is appreciably more stable than Type GN.

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Use HYCAR, General.
It won't swell.

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X-Ray Studies of Rubber

Part III—A Comparison of Two High Gum Compounds

By GEORGE L. CLARK

Professor of Chemistry, University of Illinois, Urbana, Illinois

This third article discusses two high gum compounds, mixed and cured by the author and tested by him at the University of Illinois. For a more complete understanding of this article a knowledge of the more theoretical discussions in the first two articles is desirable. Part I appeared in the February, 1941, and Part II in the April, 1941, issues. This series of articles on x-ray studies of rubber is being reproduced by courtesy of the R. T. Vanderbilt Co.—Editor.

HAVING discussed in Part I the fundamentals of x-ray analysis of structure including the experimental techniques, and having also given in Part II a summary of the x-ray contributions to our knowledge of rubber to date, we are now ready to apply x-ray analysis to a very practical problem of rubber compounding. What are the relative effects of stretching upon crystallization, as observed by x-ray patterns and measurements when two high gum compounds are compared; one containing sulfur as the vulcanizing agent, and the other containing Tuads, tetramethylthiuram disulfide, as the vulcanizing agent?

Again our procedure is to prepare rubber speci-

COMPOUNDS UNDER COMPARISON

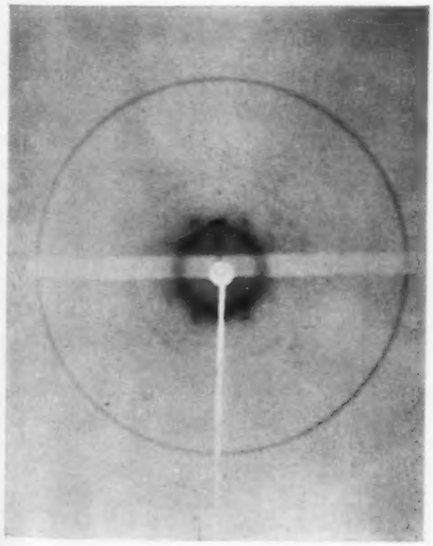
	Compound S (Sulfur Vulcanized)	Compound T (Tuads Vulcanized)
Smoked Sheet	100	100
Stearic Acid	1	1
Zinc Oxide	3	3
Altax	1	..
Sulfur	3	..
Tuads	..	3

TENSILE PROPERTIES OF THE COMPOUNDS

(Press Cure at 287° F.—40 Lbs. Steam)

	Compound S			Compound T		
	S	T	E	S	T	E
30 Min.	530	3330	800	...	....	...
60 Min.	...	....	...	480	2730	735

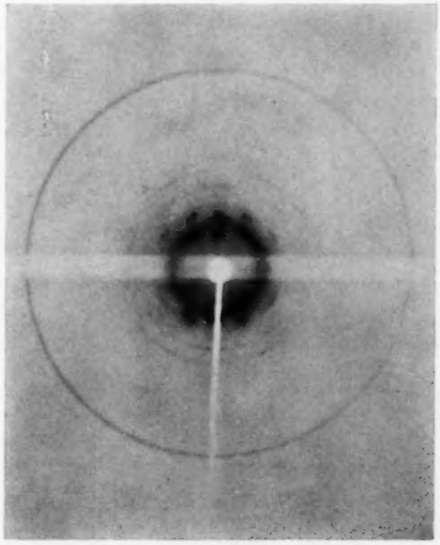
S = Stress at 500%; T = Tensile; E= % Elongation at Break.



Compound S

FIG. 1—

The X-Ray Diffraction Patterns of the Two Compounds at 500% Elongation.



Compound T

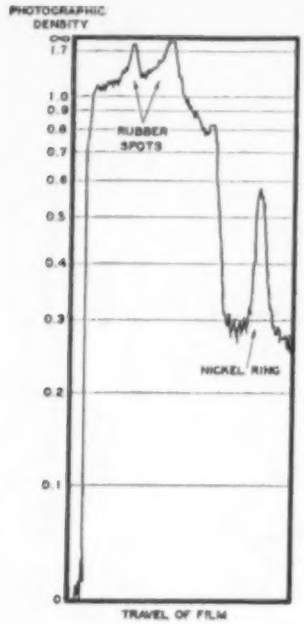


FIG. 2.

X-RAY FILM DENSITY DATA

% Elongation		Compound S R	Compound S N	Compound S R/N	Compound T R	Compound T N	Compound T R/N
300		...	...	...	.087	.258	.34
350		.058	.301	.19	.222	.261	.85
400	Extension	.185	.301	.62	.412	.270	1.53
450		.313	.270	1.16	.573	.281	2.04
500		.490	.294	1.67	.650	.277	2.35
500		.499	.264	1.89	.745	.281	2.65
450		.419	.288	1.45	.725	.291	2.49
400		.339	.309	1.10	.564	.286	1.97
350	Retraction	.215	.276	.78	.384	.258	1.49
300		.100	.282	.36	.369	.272	1.36
250		.030	.274	.11	.214	.250	.86
200		...	...	...	.072	.262	.28

R = Density of Rubber Spot; N = Density of Nickel Ring; R/N = Density Ratio.

Figure 2 is a microphotometer tracing for Compound T at 500% elongation, showing photographic density (that is, density of the silver deposit in the film) against travel of the film. The density is plotted vertically on a logarithmic scale, because the density of any photographic deposit is defined as the logarithm of the ratio of the intensity of the light falling on the silver deposit to the intensity of the light which gets through it. From this graph the desired densities are read off, and from these the density ratios are readily calculated. The table gives the essential data.

mens as closely similar as possible except for the vulcanizing agent. The usual tensile properties are then measured. Then the x-ray diffraction patterns are made under controlled conditions for each stage in the elongation of the specimen during extension and retraction with the apparatus and technique illustrated in Figures 3, 4, 5 and 6 of Part I. At the first appearance of the fiber patterns the intensity of one or more spots is quantitatively measured with the aid of the Leeds and Northrup automatic recording microphotometer. As previously described, in order to provide for variations in time of exposure, thickness of the specimen, and conditions of film development, an "internal" standard of intensity is recorded on each pattern. This is the intensity of the darker of two rings produced by a piece of nickel foil, identical in all experiments, which is used to filter all the rays out of the x-ray beam except those with the wavelength 1.54 A.U. The foil and the stretched rubber sample are arranged as in Figure 3 of Part I.

The *ratio* of the intensity of a given rubber interference spot (which increases with increasing elongation, though not linearly) to the intensity of the selected nickel ring on the same film is independent of inherent variables, and a whole series of values may then be plotted against percentage elongation.

Following are the standard conditions observed for the work described in this article:

1. Temperature constant at 24° ± 1°C.
2. Each 50 per cent increment of elongation conducted over a period of 10 seconds.
3. X-ray exposure 30 minutes for each pattern (in later work, soon to be described, reduced to 5 minutes).
4. Intervals of 15 minutes between exposures. Between extension and retraction the samples were held at 500 per cent elongation over night.
5. Fourth cycle of extension to 500 per cent elongation and retraction used for hysteresis loops.
6. All films in complete series developed at one time.

The greater density of the rubber interference spots of Compound T is clearly apparent. The horizontal "shadow" across the entire width of the film is from the rubber specimen. The blank circular spot in the very center of the film is from a lead bead used to remove the central beam of x-rays which would otherwise blacken the film. This bead is supported by a lead wire which causes the blank vertical line extending down from the center. The large outside ring is from the nickel. The fiber spots and amorphous halo of the rubber are in the center. The faint rings just outside the spots are from the zinc oxide.

In Figure 3 are presented the two complete hysteresis loops plotted from the density ratios in the preceding table. There is a large and significant difference in behavior as follows:

1. The Tuads (T) rubber specimen begins to show a fiber pattern at 300 per cent elongation, the sulfur (S) specimen only at 350 per cent elongation.

2. The curve for T rises much more rapidly than that for S, indicating greater ease and completeness of organization of the long molecules under a given stress. The maximum intensity reached at 500 per cent is about 0.7 unit of intensity ratio higher than for S, and is one of the highest so far observed with the present technique. By the method of measuring the ratio of the intensity of some fiber spot to that of the amorphous halo, and calculating the per cent of crystalline material corresponding to each ratio, the per cent of crystalline material may then be plotted against the per cent elongation in the same manner as Field *(1)* has done in his paper. Curves which look strikingly like those in Figure 3 are obtained—so much so in fact that if the ordinate values (rubber/nickel density ratio) are multiplied by a factor of 32, *we im-*

(1) *Journal of Applied Physics:* Vol. 12, pp. 23-24, January, 1941.

mediately obtain an approximate value of the per cent of crystalline or organized material at each elongation. For example, specimen T has a maximum intensity ratio of about 2.5 at 500 per cent; $2.5 \times 32 = 80$, the percentage of the specimen crystallized. Similarly, at the same elongation, sample S, vulcanized with sulfur, is about 57 per cent organized. The double check on these curves, which is best for the upper parts of the curves, and the simple relationship between two methods is indeed gratifying, since it translates an experimental intensity ratio into a definite and practical attribute of the rubber sample itself.

3. Both specimens show a marked hysteresis in the sense that there is a tendency to retain crystallinity on retraction; especially at the lower extensions. Sample S has a fairly smooth retraction curve down to disappearance of spots at 200 per cent. There is quite a discontinuity, which was reproduced several times and has a real meaning, for the retraction curve of T. Between 350 and 300 per cent extension, practically no disarrangement with decreasing stress occurred; as if a certain range of stability inherent in the linkages introduced by the vulcanizing agent had been reached. Below 300 per cent a decrease in intensity (and per cent crystallinity) again accompanies decrease in stress at nearly the same rate or slope as over the range 450-350 per cent. These discontinuities are not observed on stress-strain diagrams so that this phenomenon presents an interesting question which cannot be answered completely at present. Certainly it is a part of the total characteristics impressed upon the rubber compound by Tuads in contrast with sulfur. The diffraction spots for T persist down to below 200 per cent.

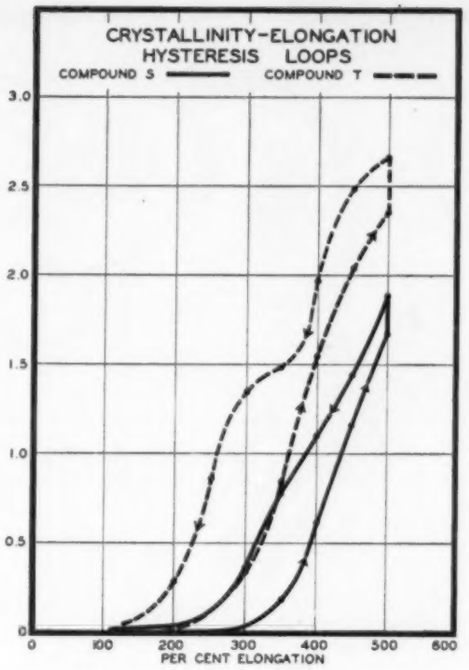


FIG. 3.

The author wishes to thank Miss Kabler of the University of Illinois for her assistance in carrying out the experimental work.

Double Duty Conveyor Belt

OFFICIALS concerned with the conservation of rubber supplies in the Dominion of Canada can have little quarrel with engineers at Francoeur Gold Mines in Temiskaming County, Arntfield, Quebec. These ingenious gentlemen are making a belt conveyor do double duty and are thus saving the cost of installing another complete conveyor and belt and helping the company make its installation at minimum capital expense. Instead of using two conveyor belts—one to carry coarse ore to the crushers and a second to convey the pulverized material in the opposite direction—one belt is being made to do both jobs.

According to standard practice a separate conveyor, in this case thirty feet long, would have been installed to carry the crushed ore back to a bucket elevator discharging into the fine ore bin. It was decided, instead, to use the lower return side or inside of the belt to carry the fine ore. A special chute was constructed with skirt boards at the bottom to place the crushed material on the belt after it had turned the pulley at the end where the coarse rock was discharged. A V-shaped scraper with a rubber face was installed to scrape the fines off the belt at the opposite end where the coarse ore is being dumped on the top of the belt at the same time. No trouble has been encountered with the fine rock being carried past the scraper and in between the belt and tail pulley. In fact, the installation has required no extra attention excepting to replace the rubber face of the scraper about once a month.

The Francoeur engineers do not expect the installation to be as efficient as the standard two belt installation. However, the economies of the situation certainly justify the experiment. Cost of installing a single conveyor in the mine was $750 of which $150 was accounted for in the cost of the belt. A double conveyor would have cost $1500 and belt life of approximately eight years could have been expected. Under the present set-up a belt need last only two years before replacement becomes necessary and the company will still obtain a total of twelve years of service for the same expenditure. If the belts last more than two years the total service obtainable for the same cost will be much greater.

The belt, as installed, differs in one respect from standard in having a back cover one-quarter inch thick instead of the one-thirty-second which would normally be used. This was necessary to counteract the constant rubbing of the scraper bar and also to relieve to some extent any strain that would be put on the carcass by lumps of crushed material becoming trapped between the belt and pulley.

Editorials . . . . . .

Conservation of Rubber

AS predicted in these columns last month, the government has launched a program designed to conserve rubber supplies. Such a program was almost inevitable in view of the fact that the government has contracted to purchase some 430,000 tons of Far Eastern crude, as well as 24,000 tons of Brazilian rubber, and up to the end of May had accumulated far less than half of that amount. The conservation program was launched not because of any impending shortage of rubber in this country, but because officials of the Office of Production Management feel that the government should have at least a 24 months' supply of rubber on hand for emergency purposes.

The program was launched under the official title of General Preference Order M-15 to Conserve the Supply and Direct the Distribution of Rubber. Its aim is to curtail present consumption of rubber by fully 20% by the end of 1941. It achieves this aim by setting up a quota system under which rubber manufacturers are required to use less rubber each month until the 20% reduction is reached in the last month of the year. Readers are referred to the full text of the order, published elsewhere in this issue, for the sliding scale of percentages and the basis on which it pivots.

In order to establish full control over the distribution of rubber, the Rubber Reserve Corporation was made the sole importer of crude rubber from the Far East into the United States. Rubber will be alloted to rubber manufacturers on the basis of their needs as determined under a Civil Allocation Program being established by the Office of Price Administration and Civilian Supply. Defense orders will, of course, receive preference over civilian orders, but it is far too early to make any definite statements as to whether any rubber manufacturer will be forced to discontinue the production of any lines intended solely for civilian consumption, despite reports to the contrary. It is not the object of the order to cause unemployment or bring undue hardship on any single manufacturer or group of manufacturers.

That point should be stressed still further. Many small rubber manufacturers are under the impression that the conservation program will result in their being forced to so seriously curtail production that they might just as well close down shop. That is pessimistic and defeatism thinking. The government, despite the autocratic efforts it is forced to adopt in cases such as this, fully intends to cooperate with the rubber manufacturing industry in every way possible.

An indication of such an intent was given in the recent decision not to impose ceiling prices on tires and tubes, "freezing" them as of prevailing prices on June 16. Shortly after the conservation program was made public, it was announced that Price Administrator Leon Henderson, head of the OPACS, would set such a ceiling to avert the possible skyrocketing of tire and tube prices. A series of conferences with leading tire and tube manufacturers, however, resulted in the decision to postpone any such action "for at least several months," on the assurance that the industry itself would prevent profiteering.

These are unusual days for the rubber industry and confusion is apparent in practically all of its branches. But clarification of the many rules and regulations being laid down by official Washington will be made and the wisest counsel is to continue "business as usual" until such clarifications put a possible new light on the situation. No one argues the logic of amassing a large reservoir of emergency rubber—a glance at the headlines in the daily newspapers is sufficient to defeat such arguments. The adoption, therefore, of a cooperative spirit is heartily recommended.

CURRENT NEWS OF THE MONTH

Curtailment of Rubber Consumption Ordered by Priority Board; Proposed "Freezing" of Wholesale and Retail Prices Deferred

AS expected, the Office of Production Management, on June 20, issued a preference order on rubber and rubber products placing all such products under priority. Termed "General Preference Order No. M-15 to Conserve the Supply and Direct the Distribution of Rubber," the order sets up a "quota" system for rubber manufacturers designed to reduce present consumption by approximately 20% by the end of the current year. In other words, it is the purpose of the O.P.M. to cut consumption of crude rubber from the current rate of approximately 817,000 tons a year to a rate of approximately 600,000 tons a year, or about 10,000 tons per year more than total consumption in 1939.

The cuts are to be made gradually, starting with the current month of July, and increasing each month thereafter until December, 1941. According to the original terms of the preference order (which is published in full elsewhere in this issue), each processor of rubber must cut his consumption of crude rubber in July to 99% of his monthly average during the twelve months ending March 31, 1941, and, using the same twelve months as a base, to 94% in August, 89% in September, 84% in October, 82% in November, and 80% in December.

Exception Made for July

However, after numerous small rubber manufacturers had registered protests with the O.P.M. to the effect that the quota system would work immediate hardships and result in the layoff of hundreds of workers, the original preference order was amended to provide that no processor shall be required to reduce his rubber consumption during July by more than 20% of his June, 1941, figure. No change has as yet been made in the percentage allotments for subsequent months, despite newspaper reports to the contrary.

Greater Stockpile Is Aim

It should be pointed out at this time that the issuance of General Preference Order No. M-15 was not occasioned by any present shortage of crude rubber supplies. The object of the order is to conserve supplies and build up a greater stockpile of reserve rubber. Although no official word has been forthcoming, it is understood that the O.P.M. intends to bring the rubber stockpile up to at least a 24 months' supply. At the end of May, stocks held by the Rubber Reserve Corporation aggregated 186,840 tons, while reserves in the hands of manufacturers and dealers aggregated approximately 172,000 tons. Stocks afloat at the end of May were 147,489 tons.

In order that the conservation program may be carried out with the minimum dislocation possible, the Rubber Commodity Section of the O.P.M. is making a statistical survey of the industry which should be completed within the next few weeks. Until the information gathered in this survey is analyzed it is doubtful whether any changes in the general preference order will be made. In a letter to the RUBBER AGE, dated July 3, H. S. Rogers, chief of the Rubber Commodity Section, stated that "we have no intention of making any general change in the order within the next few days."

Rubber to Be Allocated

There is no doubt but that the preference order will cause cuts in the amount of fabricated rubber products flowing out to competing demands, and accordingly it provides that defense orders must be filled first. After full deliveries for defense orders have been assured, rubber manufacturers may make deliveries on non-defense orders. To have overall supervision over the distribution of rubber for defense, the Director of Priorities of the O.P.M. is now allocating all rubber released by the Rubber Reserve Corporation. Further details will be available shortly.

In allocating rubber among competing civilian demands, the priorities chief will be governed by the Civilian Allocation Program launched by the Office of Price Administration and Civilian Supply. The latter organization is responsible for allocation of scarce materials among competing civilian demands after military needs are satisfied.

It is understood that the government will consider private stockpiles held by the larger rubber companies, as well as inventories of finished products, in making allocations.

The preference order makes it compulsory for all manufacturers to keep and preserve for a period of at least two years accurate and complete records of their inventories of rubber and products and materials of which rubber is a component. Falsifying of records and securing deliveries of rubber under a preference rating secured by misstatements is punishable by the refusal of further deliveries of rubber and possible criminal prosecution.

The order provides, however, that any manufacturer who considers that compliance with the order works exceptional and unreasonable hardship upon him, may appeal to the Division of Priorities of the Office of Production Management for special relief.

Ceiling Prices Postponed

Shortly after issuance of the general preference order on rubber, Leon Henderson, Federal Price Control Administrator, announced that he would shortly issue an order setting a price ceiling on tires and tubes, and other rubber products, "freezing" the wholesale and retail prices of tires and tubes at levels prevailing on June 16, 1941, and forbidding changes in the construction and quality of such products without prior consultation with OPACS.

This action was intended to prevent price advances resulting from the curtailment ordered in rubber consumption. At the same time, Mr. Henderson listed a number of major points which would be incorporated in the "freezing" order.

However, after a series of consultations with the heads of leading tire and tube manufacturers, Mr. Henderson announced on July 3 that plans to establish ceiling prices on tires and tubes (and presumably other rubber products as well) would be deferred "for some months." It is understood that the industry's representatives assured the Price Administrator that they could work out current price problems on a voluntary basis.

Request Price Consultations

It is known, however, that rubber manufacturers and major distributors have been asked to consult with OPACS in advance of any contemplated changes in list prices and in discounts from list prices, with the exception of minor adjustments in retail prices in local markets.

RUBBER RESERVE CORPORATION BECOMES SOLE RUBBER IMPORTER

Effective June 23, the Rubber Reserve Corporation, the subsidiary of the Reconstruction Finance Corporation established primarily to accumulate a reserve stockpile of crude rubber for use under possible emergencies, became the sole buyer of crude rubber exported to the United States from the Far East. Since virtually all of United States' imports come from the British Malaya and the Dutch East Indies, this action gives the government complete control over rubber supplies at the source. The announcement was made concurrently with that establishing preference over domestic consumption of rubber.

According to Jesse Jones, Federal Loan Administrator, the purpose of the action is "to accelerate the accumulation of the government reserve supply and to facilitate distribution to the manufacturing industry for defense and commercial requirements in accordance with such consumption programs as may be established by the Office of Production Management and the Office of Price Administration and Civilian Supply."

The arrangement for the Rubber Reserve Corporation to become the sole buyer of crude rubber imports from the Far East was worked out through the cooperation of the British and Dutch governments and the International Rubber Regulation Committee. Under its terms, rubber will be purchased at 18½c a pound (for ribbed smoked sheets), f.o.b. Asiatic ports. Freight charges and other carrying expenses will be borne by the Rubber Reserve Corporation.

Contracts to Be Fulfilled

Special provision has been made in the arrangement for the fulfillment of all contracts for the delivery of rubber made between private buyers and consumers, providing such contracts were consummated prior to June 23. Outstanding futures contracts on the New York Commodity Exchange are included in this provision. Thus, importers will be permitted to deliver rubber which they have already contracted for against contracts now open on the Exchange. No new sales of rubber futures can be made, however, as importers are required to deliver all purchases to the Rubber Reserve Corporation.

The obvious question, then, is what is the new status of the importer and dealer? Since the Rubber Reserve Corp. is the only organization which has an import license for rubber, private buyers are divested of opportunities to do their own buying and selling. Although no clarification of their position has yet been made officially, it appears as though such agencies will act as "brokers" for the Rubber Reserve Corp.

In other words, when the rubber manufacturer needs more crude rubber he will probably present a petition to the Priorities Division of the Office of Production Management, which, after consultation with the Office of Price Administration and Civilian Supply, will specify the amount he may secure. The rubber manufacturer will probably be allowed to name the dealer or "broker" through whom he prefers to get his rubber and that "broker" will then have the rubber delivered to the manufacturer at a price of 18½c per pound, plus carrying charges from the Far East, plus a small brokerage commission, now estimated at approximately 3/16ths of a cent per pound.

It is not known at this writing (July 9) whether certificates specifying the amounts of rubber will be issued to the rubber manufacturers by the O.P.M. for presentation to the "broker" or whether the O.P.M. will direct the "broker" to deliver specified amounts to specific manufacturers. This is one of the many details yet to be worked out by Washington.

There is little doubt that there will be some confusion in the industry with regard to securing new supplies of rubber until all of the necessary details have been worked out and absorbed. The best possible policy for the rubber manufacturer to pursue at the moment is to keep in contact with his usual source of supply which, in turn, will keep him advised of latest developments.

Coming Events

July 18. Boston Rubber Group, Annual Outing, Weston Country Club, Weston, Mass.

Sept. 11-12. Rubber Division, A.C.S., Ritz-Carlton Hotel, Atlantic City.

Oct. 7. Los Angeles Rubber Group, Mayfair Hotel, Los Angeles, Cal.

Oct. 11-14. National Association of Waste Material Dealers, Fall Convention, San Francisco, Cal.

Oct. 12-15. American Society of Mechanical Engineers, Fall Meeting, Louisville, Ky.

Nov. 3-5. American Institute of Chemical Engineers, Annual Meeting, Cavalier Hotel, Virginia Beach, Va.

40-Cent Minimum Established

A wage order establishing a 40-cent minimum hourly rate for the rubber industry, to be effective July 28, 1941, was issued on June 30 by General Philip B. Fleming, Administrator of the Wage and Hour Division. The rate was recommended unanimously by a committee equally representative of the public, and of employers and employees in the industry. The 40-cent rate will raise the wages of 9,900 of an approximate 132,000 workers in the industry, according to Administrator Fleming.

PERCENTAGES OF RUBBER USED IN AUTO EQUIPMENT

An analysis of census data for 1939, made by E. G. Holt, chief of the Consumption Materials Unit of the Bureau of Foreign & Domestic Commerce, indicates that "invisible" rubber entering into a new automobile, such as rubberized fabrics, V-belts, tubing and insulation, may account for from 15 to 20% of the total amount of rubber used as original equipment in the automotive industry.

The total of the original equipment value of tires and tubes used in automobiles in 1939, according to Mr. Holt's analysis, amounted to $155,530,000, and the value of other rubber products to $27,879,000, or 15% of the total rubber used for all purposes. The crude rubber content of the tires and tubes in 1939 averaged 825 long tons per million dollars of products, while the crude rubber content of the other products was relatively lower, owing to the greater use of reclaimed rubber and non-rubber materials.

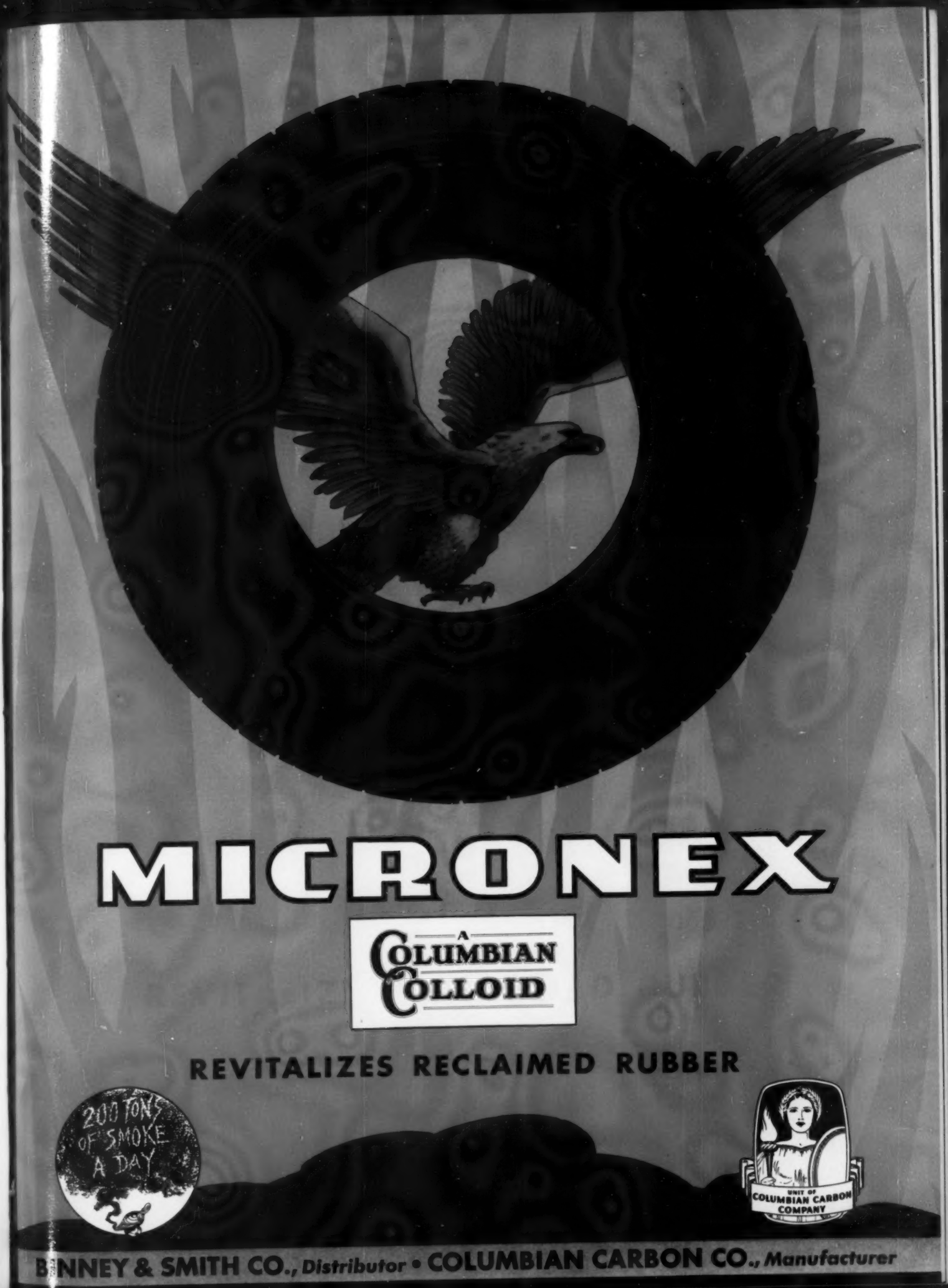
Mr. Holt's analysis showed that the value of passenger car casings used as original equipment for automobiles in 1939 amounted to $83,500,000, truck and bus casings to $52,550,000, and all inner tubes to $19,480,000, representing 31%, 33.7% and 37.1%, respectively, of total output of each of the three products in that year. Totals of other rubber goods used in new cars in 1939 follow, with the figures in parenthesis indicating the percentage of total output:

Other Rubber Goods Totals

Automobile and carriage fabrics, $428,000 (25%); motor vehicle V-belts, $1,320,000 (25%); "all other" rubber hose, $1,733,000 (10%); rubber tubing, $261,000 (10%); rubber and friction tape, $217,000 (5%); molded articles for motor vehicles, $9,346,000 (90%); mechanical rubber goods, $1,609,000 (5%); mats and matting, $2,242,000 (20%); battery jars, boxes and parts, $3,505,000 (30%); sponge rubber products, $1,113,000 (10%); tire sundries and repair materials, $882,000 (10%); all other rubber manufactures, $723,000 (2%); insulated wires, $4,000,000.

Although the percentages arrived at in the analysis are estimated only and are unsupported by statistical data, they are intended to be liberal. In connection with the analysis, Mr. Holt points out that a considerable proportion of "other rubber goods" used as original equipment in automobiles could either be made of other materials or made entirely from reclaimed rubber or even dispensed with entirely.

In this regard, he indicated that automobile fabrics need not be rubber-coated, metal hose and tubing could at least in part replace rubber, mats and matting could be dispensed with or replaced with other materials, wires could be insulated with materials other than rubber, etc.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MICRONEX MEANS MORE MILEAGE

ARMY PLACES BIG ORDERS FOR MILITARY COMBAT WIRE

At the request of the War Department, the Defense Plant Corporation, an RFC subsidiary, has executed lease agreements with the U. S. Rubber, Anaconda Wire & Cable and Okonite companies calling for the construction and equipment of special plants for the manufacture of "assault wire", said to be an extraordinary new combat wire developed over the last 15 years by the Army Signal Corps and U. S. Rubber, using a process developed by the latter.

Under the terms of the agreements, Anaconda will construct and equip a manufacturing plant at Marion, Indiana, while Okonite and U. S. Rubber will acquire machinery and equipment for installation in present plants at Paterson, N. J., and Bristol, R. I., respectively. The Defense Plant Corporation will retain title to all of the machinery and equipment purchased under these agreements, and in the case of Anaconda will lease the factory to be constructed to the company.

The total amount involved in the three agreements is $1,367,008.48. In addition to this amount, the Army has placed orders with the three companies for the "assault wire" to be manufactured. U. S. Rubber, for example, has an order for approximately $3,143,000 of the wire. The new type wire, incidentally, weighs between 28 and 29 pounds per mile, as compared with the former type used by the Army which weighed about 160 pounds per mile. U. S. Rubber has licensed other companies to make the wire.

Crude Rubber Developments

A number of important decisions were made on the crude rubber front in the past few weeks, in addition to that establishing the Rubber Reserve Corporation as the sole importer of crude rubber from the Far East into the United States. Among these were the following:

Under the terms of a recently concluded trade agreement between the United States and Brazil, the United States will purchase the entire Brazilian surplus of a group of strategic materials, including rubber. This agreement covers a two-year period. The price for the rubber was not specified.

According to a report from Singapore on June 27 the Netherlands Indies will discontinue all sales of rubber to Japan at the end of 1941 and will deliver virtually its entire output to the United States. This arrangement, it was intimated, would continue for the duration of the European war.

A report from the Department of Commerce at Washington, early this month, indicated that there were no stocks of rubber on hand for sale at the end of May in either Para or Manaos.

Soviet Russia is reported to be negotiating in the Far East for large purchases of rubber and tin. It is believed that a quantity of rubber will be sold to that country, probably at prices equal to that paid by American buyers.

Technical Booklets Available

The British Rubber Producers' Research Association, 19 Fenchurch Street, London, E.C. 3, England, has recently made available several new technical booklets, consisting largely of reprints of articles originally appearing in leading English scientific and technical journals. Included among the booklets available are the following: *The Molecular Weights of Rubber and Related Materials. I. Experimental Methods,* by G. Gee; *The Molecular Weights of Rubber and Related Materials. II. Osmotic Pressure and Viscosity of Solutions of Raw Rubber,* by G. Gee; *Relation Between Molecular Weights and Physical Properties of Rubber Fractions,* by G. Gee and L. R. G. Treloar; *Crystallization Phenomena in Raw Rubber,* by L. R. G. Treloar. Copies are available without cost from the Association.

Introduces Bill on Guayule

Representative John Z. Anderson, Republican, of California, introduced a bill (H.R. 5030) in the House of Representatives on June 11 providing for the planting of 45,000 acres of guayule "in order to make available a domestic source of crude rubber for emergency and defense uses."

Under the terms of the bill, which was referred to the Committee on Agriculture, the "Federal Guayule Rubber Corporation" would be organized, with a capital stock of $25,000,000, subscribed to by the Treasury Department, which would acquire "by purchase, license, or other agreement" the right to operate under patents now held by the Intercontinental Rubber Co. relating to the planting of guayule or the extraction of rubber from that plant.

According to Congressman Anderson, planting of 45,000 acres would provide about 5% of a year's supply of rubber for domestic demand and would furnish seed for planting a ten-fold increase in acreage. Guayule plants are best harvested every four years.

ORGANIZE NAUGATUCK CHEMICALS, LTD., TO TAKE OVER ACTIVITIES IN CANADA

View of the new Canadian plant. Top, Paul C. Jones, president. Right, R. B. Marr, general manager.

Establishment of a new Canadian corporation, to be known as Naugatuck Chemicals, Ltd., has been announced by the Naugatuck Chemicals Division of U. S. Rubber Co. and the Dominion Rubber Co., Ltd. The latter is a 100%-owned subsidiary of the U. S. Rubber Co. The new company, which will operate in liaison with the Naugatuck Chemical Division in the United States, will occupy enlarged buildings at Elmira, Ontario, at one time operated as the Elmira rubber factory.

Naugatuck Chemicals, Ltd., will produce accelerators, antioxidants, and other chemicals for the rubber industry. In addition, it will produce aniline oil, a vital product required by the Canadian government for war purposes, as well as diphenylamine, a stabilizer for smokeless powder. Also scheduled for production is a line of agricultural chemicals. The parent chemical plant at Naugatuck, Conn., has been increasingly occupied with the manufacture of such chemicals.

Paul C. Jones, president of the Dominion Rubber Co., is president of the new company. John P. Coe, general manager of the Naugatuck Chemical Division of U. S. Rubber, is vice-president. Other officers are M. O. Simpson, treasurer; I. W. Holme, secretary; and G. R. Dobbin, assistant secretary-treasurer. R. B. Marr, formerly chief chemist of Dominion Rubber, has been named general manager, and H. Wintsch, formerly assistant to the production manager at Naugatuck, will act as production manager.

ANNUAL OUTING HELD BY RHODE ISLAND RUBBER CLUB

Approximately 95 members and guests attended the annual outing of the Rhode Island Rubber Club, held at the Pawtucket Golf Club, Pawtucket, R. I., on Friday, June 13. Forty players participated in the golf tournament, with the following winners: *Low Gross,* Harold Simmons; *2nd Low Gross,* J. W. Morrisey; *3rd Low Gross,* J. H. Christopher and Len Yates, tied; *Blind Bogey,* J. Cryan, James Murray and William Fish.

After dinner, Alan Grant, vice-president of Charles T. Wilson Co. and president of the Rubber Trade Association of New York, delivered an off-the-record address on "Rubber Importing and Trading Under Virtual War Conditions." The talk was very well received by the audience and elicited several questions from the floor.

A number of prizes were distributed to winners in various events, the prizes having been made possible by donations from the following companies: American Zinc Sales, Robert Badenhop, Baird Rubber, Binney & Smith, Cleveland Liner, Farrel-Birmingham, Wm. D. Eggleston, Firestone, C. P. Hall, Hookless Fastener, Ernest Jacoby, Krebs Pigment, Meyer & Brown, Monsanto, Muehlstein, Pequanoc Rubber, Phillips Bros., Scott, Schulman, Stamford Rubber Supply, United Carbon, U. S. Rubber Reclaiming, R. T. Vanderbilt, Weller Chemical, L. G. Whittemore, Wishnick-Tumpeer, and Xylos Rubber.

DATA ON BOOTS AND SHOES RELEASED BY CENSUS BUREAU

Approximately four-tenths, 40.3%, of the rubber boots and shoes produced in the United States during 1939 were marketed by selling organizations owned and operated by manufacturers, according to a report by the Bureau of the Census on the primary channels used by manufacturers of these products in disposing of their wares. An additional 29.2%, the report indicated, went direct to retailers for resale, and 18.0% to wholesalers and jobbers.

Sales from point of production to commercial, governmental, and other users amounted to 8.8% of the total 1939 output. Relatively small amounts were produced for export and for sale direct to consumers at retail.

The industry, as reported by the Census of Manufactures, consisted of 13 establishments with value of products for the year of 1939 amounting to $49,980,591 (preliminary figure). Sales and intra-company transfers of these thirteen plants amounted to $52,428,000.

Sales as shown in this report may differ from value of products for several reasons: (1) Sales are affected by changes in inventory between the beginning and end of the year; (2) in a few instances, sales were reported on the basis of selling price rather than value of products; and (3) some plants in the industry purchase and sell goods which they do not process. The latter, included in sales but not in value of products, amounted to $2,900,000.

AKRON RUBBER GROUP HOLDS ANNUAL OUTING ON JUNE 20

Perfect weather brought out a record attendance for the annual outing of the Akron Group, Rubber Division, A.C.S., held at the Silver Lake Country Club, Akron, on Friday, June 20. More than 120 members and guests participated in the golf tournament held during the afternoon, while 474 were served dinner in the evening. Approximately 150 prizes were distributed after dinner.

V. K. Hitch, of the Akron Chemical Co., acted as general chairman of the outing, ably assisted by Ed. Nahm, of Naugatuck Chemical, as vice-chairman. The chairmen of the various committees follow: *Prize Solicitation,* T. L. Stevens (C. P. Hall); *Prize Awards,* C. B. Moore (Philadelphia Rubber Works); *Finance & Tickets,* D. G. Benson (Goodrich); *Golf,* Jack Waite (Dugan & Campbell); *Refreshments,* Fred Bonstedt (Binney & Smith); *Publicity,* A. E. Warner (C. P. Hall); *Tomfoolery,* Shorty Marshall (C. F. Marshall).

Boston Outing Scheduled

The Boston Group, Rubber Division, A.C.S., will hold its annual outing on Friday afternoon, July 18, at the Weston Country Club in Weston, Mass. An interesting line up of sporting events, including a golf tournament, is planned for the afternoon, to be followed by a dinner at the club house in the evening. Prizes will be awarded to winners in the various events. The outing is in the hands of Frank B. Ward, of the Panco-Panther Co., Chelsea, Mass., and Harry A. Atwater, of the Hood Rubber Co., Watertown, Mass.

Water-Soluble "Carbowax" Compounds

A series of "Carbowax" compounds, in two forms, one resembling petrolatum and the other paraffin wax, have been developed by the Carbide & Carbon Chemicals Corp., New York City. These compounds are said to be miscible in almost all proportions with water, forming clear solutions, this characteristic making them useful for a number of applications. One of the compounds, "Carbowax" 4000, when added to water, is said to make an excellent mold lubricant for rubber molds, imparting an attractive finish to the completed article.

Some of the record-breaking crowd who attended the Annual Outing of the Akron Rubber Group, held at the Silver Lake Country Club on June 20.

TESTING MATERIALS SOCIETY HOLDS 44th ANNUAL MEETING

With a registered attendance of more than 1,550, an all-time high, the American Society for Testing Materials held its 44th Annual Meeting at the Palmer House in Chicago from June 23 to 27. More than 250 committee meetings were held during the week. Other features of the meeting included the Sixth Exhibit of Testing Apparatus and the Fourth Photographic Exhibit. G. E. F. Lundell, chief of the Chemistry Division of the National Bureau of Standards, was elected president, succeeding W. M. Barr.

The Sixteenth Edgar Marburg Lecture was delivered by Dr. Harry L. Fisher, director of organic research for U. S. Industrial Chemicals, Inc., Stamford, Conn., on Wednesday afternoon, June 25. Taking as his subject, "Natural and Synthetic Rubbers," Dr. Fisher pointed out that vulcanized synthetic rubber compounds are superior to rubber compounds in that they show a better resistance to the action of oils and fats (vegetable and mineral) and many solvents, are more resistant to heat, age better in storage and sunlight, and show a better resistance to the action of ozone and oxygen.

Dr. Fisher also stressed the point that synthetic rubber compounds have a lower permeability towards gases, have a lower water absorption, and show a better resistance to many corrosive chemicals. He indicated, however, that natural rubber still exhibits superiority to all the synthetics now available in elasticity and rebound, low-heat generation through hysteresis, extensibility, and resistance to stiffening at low temperatures.

The Sixth Session of the meeting, held on Wednesday, June 25, was devoted to papers and reports on electrical insulating materials and rubber. In the portion of the session devoted to rubber, W. C. Geer and W. Burton Wescott described a method for the testing of adhesive tape. The specific materials covered in an extensive investigation were cloth-backed industrial adhesive tape and paperbacked masking tape. The adhesives tested were pressure-sensitive ones containing rubber as the basic ingredient. (EDITOR'S NOTE: This paper is published in full elsewhere in this issue).

Various recommendations made to the Society by Committee D-11 on Rubber Products were the result of an extremely active year. Of much importance are three proposed standards covering tests for automotive air brake and vacuum brake hose, tear resistance of vulcanized rubber, and test for compression fatigue of vulcanized rubber. The first of these new standards was developed by Technical Committee A on Automotive Rubber in response to urgent requests of automotive engineers and state highway departments for suitable standards for the control of the brake hose used on licensed vehicles on the highways.

Three of the twenty-five exhibits of rubber chemicals and compounding ingredients which was one of the features of the meeting of the Chicago Rubber Group, held at the Congress Hotel, in Chicago, on June 6.

The status of air brake hose and vacuum brake hose is similar to that of hydraulic brake hose for which suitable methods were approved last year. The use of inferior or defective hose on vehicles equipped with these braking systems is especially serious from a safety viewpoint because of their widespread application to automotive vehicles and to heavy trucks in particular. Specifications for the material are being issued by the Society of Automotive Engineers which is jointly responsible with A.S.T.M. for the technical committee.

The test for tear resistance of vulcanized rubber describes a procedure which is widely used for the usual grades of soft vulcanized rubber, such as tire tread, carcass, and inner tube compounds, or those used in most mechanical rubber goods. It does not apply to the testing of material ordinarily classed as hard rubber. Since tear resistance is affected to a large degree by mechanical fibering of the rubber under stress as well as by stress distribution, speed of stretching, and size of specimen, the results obtained in a tear resistance test can only be regarded as a measure of the resistance under the conditions of that particular test and not necessarily as having any relation to service value.

Tests for compression fatigue of vulcanized rubber are intended for use in comparing the rate of heat generation and the fatigue characteristics of vulcanized rubber compounds that may be subjected in use to dynamic compression strains. However, the methods yield comparative data on which to base judgment as to service quality, and are especially useful in research and development work.

Other important recommendations of the committee are to refer to A.S.T.M. letter ballot for adoption as standard eight existing tentative standards, four tests, and four specifications, the specifications covering various types of insulating wire and cable.

May Double Tire Levy

The tax-writing committee of the House of Representatives has doubled the tax levy on tires and tubes in the new defense tax bill, according to U. S. Senator Robert A. Taft of Ohio. When the measure reaches his own committee, Senator Taft indicated that he would carefully weigh the argument presented by tire and tube manufacturers that the ad valorem tax on tires and tubes is higher than the rate on other automobile parts and accessories.

To Broaden Operations

Stockholders of the U. S. Rubber Co., at a special meeting held in Jersey City on July 8, approved an amendment to the certificate of organization which will permit the company to broaden the scope of its activities. No explanation has been made as to new business operations under consideration other than that they will be related to the defense program.

NAMES IN THE NEWS

WILLIAM HENRY STEVENS, noted British rubber technologist, now associated with the Monsanto Chemical Co. of London, arrived in the United States by clipper on June 26 to study American methods of producing self-sealing gasoline tanks and oil-proof airplane parts, particularly made from Thiokol.

A. R. KEMP, in charge of organic chemical research and development work for the Bell Telephone Laboratories, Inc., at New York City, was recently made an active member of the American Institute of Chemical Engineers.

DOUGLAS MUELLER, for the past three and one-half years a member of the editorial staff of the *Cleveland Press*, has joined the Seiberling Rubber Co. at Akron as advertising assistant in charge of public relations. He will also assist in sales promotion.

W. A. HAZLETT, managing director of the Goodyear organization at Wolverhampton, England, was recently elected a director of the American Chamber of Commerce, which maintains headquarters in London, England.

ARTHUR W. CARPENTER, manager, testing laboratories, B. F. Goodrich Co., was elected to the Executive Committee of the American Society for Testing Materials at the annual meeting of the Society held in Chicago late last month. He will serve for a two-year term.

H. MUEHLSTEIN, president of the crude and scrap rubber firm bearing his name, has been appointed Chairman of the Rubber Committee of the Commerce and Industry Division of the United Service Organization Campaign.

C. B. WEBB, head of the rubber manufacturing firm bearing his name in Lebanon, Penna., was recently elected president of the Lebanon Chamber of Commerce. The Webb factory manufactures the famous Weaver valve and health balls.

TERRENCE E. WILLIAMS, who has been working in the physical testing laboratories of Goodrich at Akron for the past few years, has been appointed assistant secretary of the Goodrich Company (SS) Ltd., the crude rubber buying office of the company at Singapore. He left for his new post on July 5.

DR. NORMAN A. SHEPARD, director of the Stamford laboratories of the American Cyanamid & Chemical Corp., has been made Chemical Director for that company, with headquarters at the general offices in New York City.

Holt in New Position

Several months ago all of the commodity or industrial divisions of the Bureau of Foreign & Domestic Commerce, including the Leather & Rubber Division, were abolished and consolidated in a new Division of Industrial Economy. The latter division consists of the Consumption Materials, Durable Materials, Merchandise, Finished Durable Goods and Public Utilities units, and the Export-Import Market Information Unit. Everett G. Holt, formerly chief of the Leather & Rubber Division, is now chief of the Consumption Materials Unit.

The Consumption Materials Unit has jurisdiction over information concerning various industries, including rubber and manufactures. Within the unit, the work of each major industry is handled by an industry analyst, usually one of the former commodity business specialists. Mr. Holt, in addition to being chief of the unit, also has a personal status as industrial consultant for rubber and leather.

CHARLES A. STILLMAN, vice-president, Goodyear Tire & Rubber Co., received his 20-year pin last month. He joined the company as secretary in 1921 and was made vice-president in 1926.

W. E. POWELL, manager of sundries sales, Miller Division, B. F. Goodrich Co., and EDGAR M. THORP, production manager of the same division, were among 10 employees who completed 20 years of service with the company last month. Both received service pins.

HAROLD C. HASKELL, director of the legal department of E. I. du Pont de Nemours & Co., Inc., and former legal director of the Hood Rubber Co., was elected a Du Pont director on June 16.

CLYDE DELONG has been named operating manager of the mechanical sales division of the B. F. Goodrich Co., succeeding F. A. LANG who has been transferred to the managership of heel and sole sales. The former joined Goodrich in 1928.

LEO J. DETE, research chemist, Pharis Tire & Rubber Co., was elected president of the Newark, Ohio, Y's Men's Club last month. For the past year he acted as vice-president of the organization.

C. S. SNIDER, of the American Hard Rubber Co., was elected second vice-president of the Export Managers Club at the annual meeting of that organization held in New York City on June 17.

Evans Joins Boston Woven Hose

Walter W. Evans, who has been director of research for the Ludlow Manufacturing & Sales Co., Boston, Mass., for the past thirteen years, has joined the

Walter W. Evans

Boston Woven Hose & Rubber Co., Cambridge, Mass., to initiate special research on items of interest in connection with the defense program. Mr. Evans has had a long career in the rubber industry. He entered the industry in 1911 as a research chemist for Goodrich, later serving as chief chemist of the Philadelphia Rubber Works. Returning to the parent organization he occupied several important positions, including that of technical superintendent of the mechanical goods department. In 1927, Mr. Evans left Goodrich to join the R. T. Vanderbilt Co., remaining with that concern until October 15, 1928, when he resigned to become associated with the Ludlow concern which manufactures jute and flax products, using latex in connection with several of these products. In 1920 Mr. Evans served as chairman of the Rubber Division, A.C.S.

New U. S. Tire Appointments

Arnold F. Van Pelt has been appointed assistant general manager of the Tire Division of U. S. Rubber Co. At the same time, Emmet Sheahan, general manager of the division, announced several other executive appointments within the division, as follows: F. S. Carpenter was named to the post of production manager of the division; Howard N. Hawkes is to be general sales manager; Irving H. Johnson, general control manager; and Harmon F. Newell, sales and production co-ordination manager. All of the appointees have been members of the United States Rubber organization for many years. Headquarters of all of these executives will be in the United States Rubber Company Building, in Rockefeller Center, New York City.

REVEAL DETAILS OF THE THIRD RESERVE AGREEMENT

Some of the details concerning the third agreement between the United States and the International Rubber Regulation Committee were brought to light last month. The agreement, originally arranged on March 7 by trans-Atlantic telephone and subsequently drafted and signed, covers a total of 100,000 tons. The price is set at 17 to 18½c per pound, f.o.b. Asiatic ports as in the second agreement, but it differs in one important respect, *i.e.*, no fixed time limit is set for deliveries.

The difference is regarded in rubber circles as a concession to the Regulation Committee. Under the restriction scheme permissible shipments are now set at 100% of quotas, which means that technically shipments will be considerably in excess of consumption. Therefore, the completion of reserve purchases by this government would require a sudden sharp cut in export quotas, entailing considerable difficulties for the plantation interests.

It is believed that the 100,000 tons provided for in the latest agreement will be released gradually in 1942, after completion of the 330,000 tons called for in the first two agreements, which will give the Regulation Committee an opportunity to reduce permissible shipments in stages, thus softening the adverse influences of the eventual cut.

Carbon Black Prices Raised

Effective July 1, the price of compressed carbon black, in bags, carload lots, increased from .03175 to .0335 cents per pound, f.o.b. plant. A greater advance was first announced but was later modified by the industry to the increase indicated. These prices are effective for the third quarter of the current year. Shortly after the advance was announced, Leon Henderson, director of the Office of Price Administration and Civilian Supply, addressed a letter to all carbon black producers stating that it was the policy of his office "that no price increase should be made at this time unless rendered necessary by increased costs of operations, and that as a matter of policy major price changes should be taken up with this office in advance." Mr. Henderson invited these producers to confer with his office concerning the price situation.

Changes at Naugatuck Chemical

According to J. P. Coe, general manager of the Naugatuck Chemical Division of the U. S. Rubber Co., the following changes have been made in that organization: J. E. Caskey is now assistant general manager; P. E. Rice, factory manager; R. E. Casey, general sales manager; W. F. Tuley, sales manager, rubber chemicals and reclaim; A. J. Anderson, general control manager. The promotions were effective on June 20.

Streamlined Gas Mask

The first attempt to enable wearers of gas masks to resemble human beings instead of grotesque ogres from Mars is seen in the accompanying reproduction

of a new type of streamlined gas mask. The mask was designed by Charles W. Leguillon of the B. F. Goodrich Company and is made from transparent plastic materials. Impervious to noxious gases, dust and vapors, the mask also has a design feature that prevents eye lenses from fogging.

Open Venezuelan Plant

The new plant of the General Tire & Rubber Co. in Venezuela, located at Apartado 987 in Chacao, a suburb of Caracas, was formally opened with proper ceremonies on June 17. The plant, which will produce 200 tires and an equal number of tubes daily, is being operated by the Compania Anonima Nacional, Manufacturera de Caucho y "Neumaticos General." Dr. J. M. Travieso Paul is president of the company and Ramon E. Tello general manager. Harry J. Conroy, of Akron, will supervise production. William O'Neil, president of General Tire, and Joseph A. Andreoli, vice-president and general manager of the General Tire & Rubber Export Co., were present at the formal opening of the plant.

To Make Barrage Balloons

The U. S. Rubber Co. has received an educational order for the production of barrage balloons from the U. S. Army Air Corps. The balloons will be made at the former Alice Mill in Woonsocket, R. I., which has been closed for the past ten years. The plant is already being equipped for the manufacture of the balloons and rigging, but the ascension cables will be made elsewhere. Neoprene will be used in the manufacture of the balloon fabric.

NEW PROGRAM PLANNED FOR SYNTHETIC RUBBER

According to advices from Washington, officials of the Reconstruction Finance Corporation have agreed on a new program for the increased production of synthetic rubber in the United States, one which will result in the overall production of 80,000 tons a year. Half of this total, it is understood, will be produced in new plants to be erected and operated by the government, and half by the four plants already subsidized.

As long ago as last fall, it will be remembered, officials of the Office of Production Management were said to favor a $200,000,000 program calling for government-financed synthetic rubber production, designed to provide an output of 300,000 tons annually. Subsequently, the question of synthetic rubber production was taken out of the hands of that agency and placed in that of the O.P.M.

The new program, according to report, will be financed by the Defense Plant Corporation, an R.F.C. subsidiary, and will entail several privately managed factories. One of the present producers of commercial synthetic rubber will probably be invited to manage the plants while others will be asked to supply the essential technical help so that the entire industry can observe results.

Name Rubber Priority Group

The Office of Production Management at Washington, D. C., has formed a rubber priorities committee to help it in its plans to place all crude rubber supplies on a priority basis. James S. Adams, chief of the O.P.M. division of materials from agriculture, will serve as chairman of the group, while A. L. Viles, president of the Rubber Manufacturers Association, will be made a member. The committee, officially known as the Rubber Industry Advisory Committee, includes the following: P. W. Litchfield (Goodyear), A. L. Freedlander (Dayton Rubber), J. W. Thomas (Firestone), Harry E. Smith (Manhattan Rubber), H. E. Smith (U. S. Rubber), F. Thatcher Lane (Seamless Rubber), A. A. Garthwaite (Lee Rubber), Frank Jones (Okonite), and R. E. Bloch (Mohawk Rubber). Frank Grillo, international secretary-treasurer of the United Rubber Workers of America, has been named special adviser representing labor of the committee.

Synthetic Plant in Manchuria

The Manchuria Electrochemical Industry Co., a state company capitalized at 30,000,000 Manchurian yen, is engaged in building an experimental plant for the manufacture of synthetic rubber, according to the Department of Commerce. Actual production is planned for August or September. The new factory is located in Kirin, Manchuria.

Murray Factor in Tube Business

The Murray Tire & Rubber Co., located at 2008 Avenue B South, Birmingham, Alabama, has steadily increased its manufacturing facilities until today the company is recognized as one of the factors in the inner tube business, employing 10 workers, having 7 salesmen, selling in 16 states, and having a capacity to produce 2400 tubes per day. Although still a small organization when compared with the tire manufacturers, nevertheless the company is growing rapidly and enjoys a good reputation in the South.

The company is the outgrowth of the Murray Tire Co., Inc., which was formed in 1928 to engage in retreading. By 1936 that concern was operating 11 full circle retread molds, but its plant was gutted by fire in April of that year. Looking toward the future, the Murray Tire Co., Inc., was dissolved and the Murray Tire & Rubber Co. formed, with S. T. and Lillian Murray as partners and Carl Murray as general manager. Part of the retread molds were sold and three inner tube molds purchased.

Early in 1937 the new company began to make inner tubes, selling them along with its retreaded tires. As tube production increased less attention was paid to the retreading end of the business and finally in 1939 the company sold its retreading equipment and began to concentrate solely on tubes. Three more tube molds were purchased and, later, an additional three, so that the company is now operating nine molds. Most of the tubes manufactured are sold to automotive jobbers. The company plans to buy or build its own factory sometime this year.

Named Rubber Price Chief

Ben W. Lewis, professor of economics at Oberlin College, was named price executive in charge of the rubber and rubber products section of the Office of Price Administration and Civilian Supply on July 2. The appointment was announced by Dr. J. K. Galbraith, assistant administrator in charge of the price division. Dr. Lewis, who is on leave from Oberlin, has been chief economist in the consumer division of OPACS and previously was chief economist of the consumers' counsel division of the Department of the Interior. During N.R.A. days, Dr. Lewis was code supervisor of the Consumers' Advisory Board.

Rubber Collars for Pilots

Rubber collars designed to keep military pilots from losing consciousness on 300-mile-an-hour turns were described at the American Medical Association's convention held in Cleveland on June 5 by Dr. John Fulton of Yale University. Pointing out that loss of blood from the brain causes pilots to lose consciousness on sharp turns at tremendous speed, Dr. Fulton said that the rubber collars are designed to slow the flow of blood from the head in such maneuvers. He also revealed that rubber "lifebelts" intended to impede the downward rush of blood from the region of the heart are also under experimental use.

Two New Thiokol Types

Thiokol Corporation, Trenton, N. J., has announced the availability of two new types of "Thiokol" synthetic rubber, Type FA and Type RD. Features of Type FA are said to include improved processing characteristics, no gas during processing, reduced odor, unique solvent resistance, and low permeability. Type RD features non cold flow, improved physicals, high test resistance, good molding characteristics, good solvent resistance, and absence of odor in the finished product.

The Cincinnati Rubber Mfg. Co., Cincinnati, Ohio, has entered the field of multiple V-belts, and is now prepared to supply all standard sizes as regularly required for multiple V drives.

FINANCIAL

Firestone Tire & Rubber Co.

Six months to April 30: Net profit of $4,789,165, equal to $1.75 a share on common stock outstanding, which compares with $2,565,661, or 60c a share, in the similar period a year ago, representing a gain of $2,223,504. Provision of $1,500,000 was made for additional reserve for future declines in foreign exchange and other contingencies, compared with a provision of only $500,000 for such reserve a year ago. According to John W. Thomas, president, the latest net profit figure was set after the deduction of depreciation, interest, and Federal taxes, including an estimated $600,000 of excess-profits taxes. Earnings included profits of certain foreign subsidiaries which remitted "an equivalent amount of dividends."

Lee Rubber Asks Tenders

Lee Rubber & Tire Corp., Conshohocken, Penna., recently sent notices to stockholders soliciting tenders for approximately $671,000 of the company's outstanding capital stock. The tender invitation, which involves approximately 10% of the outstanding shares, will entitle holders on July 11 to participate and will expire on July 24. The price at which tenders may be made has been fixed at $25.00 a share and calls for acceptance of 26,834 shares. In case a greater number of shares is tendered, acceptances will be prorated.

Offers Series of Reprints

The West Java Proefstation, Buitenzorg, West Java, N.E.I., has for some time been publishing "Communications," consisting of articles on rubber and latex reprinted from *Archief voor de Rubbercultuur*. Although these articles are printed in Dutch, practically every one includes a brief summary in English. They are offered without cost on request. Titles of booklets currently available follow:

The Dialysis of Latex and the Properties of Dialyzed Latex, by G. E. van Gils.

Some Experiments on the Aging Properties Under Atmospheric Influences of Rubber Films Obtained from Latex Compounds Containing Vulcanization Ingredients, by G. J. van der Bie.

Isolation and Identification of Lecithins from Hevea Latex, by R. F. A. Altman and G. M. Kraay.

Preliminary Researches Concerning the Conductivity of Latex, by G. E. van Gils.

Criticism of Tentative Procedures for Testing the Variability of Normal and Concentrated Latex, by G. E. van Gils.

Concerning Van Harpen's "Hydratant Acid" ("H-Acid"), by R. F. A. Altman.

Effect Upon Latex of Rapid Stirring and the Influence Thereof on the Creaming, by J. W. van Dalfsen.

Organic Analysis of Hevea Latex. IV. Amino Acids, by R. F. A. Altman.

Preparation and Properties of Mealorub Rubber Powder, by J. W. van Dalfsen.

Vulcanization of Latex: Differences in the Behavior of Fresh, Old and Purified Latex, by J. W. van Dalfsen.

Seek Substitute for Spence

Dr. David Spence, of the Jacques Loeb Laboratories, selected as the first Charles Goodyear Lecturer, will be unable to attend the meeting of the Rubber Division, A.C.S., scheduled for Atlantic City, on September 11 and 12. Dr. Spence has been ill for the past few months and has been ordered by his doctor not to undertake the trip. Accordingly, the lecture will be postponed. Dr. R. H. Gerke, Chairman of the Division, is seeking a substitute speaker. Both E. G. Holt, Chief, Materials Consumption Unit, Bureau of Foreign & Domestic Commerce, and E. R. Bridgwater, manager, Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., are also scheduled to speak.

An interesting article on the role being played by rubber manufacturers in the National Defense Program appears in the June, 1941, issue of the *Monsanto Magazine*, house organ of the Monsanto Chemical Co., St. Louis, Mo., under the title of "Elastic Sinews of Defense," by C. W. Christensen, who was recently promoted to general manager of sales of the company's Rubber Service Department.

NEWS IN BRIEF

Beautiform swim suits, made by the Best Mills, are now being sold in a cleverly designed transparent Pliofilm display package which serves the purchaser both as a bathing suit and beach bag. The package has a simple drawstring closure.

A specially designed light-weight air hose for pneumatic riveters, chippers and other tools has been announced by U. S. Rubber. The new product, weighing only 20 pounds per 100 feet, is said to cut in half the load to be carried by workers handling pneumatic tools.

Goodrich has developed the Multi-ring Silvertown Tire, a dual advantage tire for the front wheels of farm tractors which combines the principles of the Skid-ring tire with those of the long-wearing rib-type tractor tire.

The National Association of Independent Tire Dealers, Inc., 30 North La Salle St., Chicago, has prepared an "Official Chart of List Price Levels for Passenger Car Tires" and an "Official Comparative Chart of Listings for Truck and Truck-Bus Tires." The booklets sell for 5c each, less in quantity.

An "Information and Technical Data Book" on Seiberling truck and bus tires has been made available by the Seiberling Rubber Co., Akron, Ohio. Copies are available on request.

Clyde A. Crowley and Harry Bennett, the former well known for his work in electro-chemistry and the latter as Editor-in-Chief of the "Chemical Formulary," have organized the technical consultant firm of Crowley & Bennett. Chicago headquarters are at 6803 North Clark Street. The Eastern branch is at 228 King St., Brooklyn, N. Y.

The Ohio Supreme Court has handed down a decision refusing to restrain the Standard Oil Co. from giving a warranty and adjustment agreement to purchasers of tires. The court held that the warranty is not a contract of insurance, as alleged by the state's attorney general.

The Bureau of Foreign & Domestic Commerce has removed its New York regional office from 602 Federal Office Building to Room 2600, 500 Fifth Avenue. The new telephone is WIsconsin 7-1990.

O'Sullivan Rubber Co. has leased a six-story and basement building at 151 Hudson Street in New York City where it will maintain its general offices and warehouse facilities as soon as extensive alterations are made.

Red, white and blue striped tennis Keds, designed for U. S. Rubber by William T. "Bill" Tilden, will be on the market soon. The shoe is sturdily made of heavy canvas and has a cushioned inner sole.

The world's largest bomber, an 80-ton aerial fortress, designated as the "B-19," will be equipped with the largest set of De-Icers ever built, according to Goodrich engineers. Weighing 395 pounds, the pulsating rubber "overshoes" have six times the area of those used on a regular 21-passenger commercial transport plane. They total 287 feet in length.

A powder which is said to eliminate from automobiles all radio static interference and static shock caused by the friction of rotating parts, including wheels, fan belts and tires, has been developed by U. S. Rubber. It will be marketed under the trade name of U. S. Automotive Static Neutralizer. The powder is blown into the tubes.

Seiberling Rubber Co. of Canada, Ltd., is building a large, modern addition to its plant at Toronto, Ontario. The new building will measure 100 feet square, will be two stories high, and will represent an investment of approximately $100,000.

Goodrich has registered the name "Transcord" with the U. S. Patent Office and will use the name as a brand to denote use of the company's transverse cord breaker in either cord conveyor or fabric conveyor belting.

The annual award of the National Advertising Agency Network for "The Best Advertising Campaign in Business Papers" has been awarded this year to the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. J. J. DeMario is advertising manager of the company.

A patent has been granted to E. H. Barder, superintendent, tire division, and C. E. Snyder, chief, tube construction, of the B. F. Goodrich Co., Akron, for a new type inner tube said to facilitate the balance of wheel assemblies. A feature of the tube is an increase in the thickness of the tube wall in an area at the valve stem.

Industrial Products Co., distributors of safety equipment of all kinds, has announced its removal from 800 West Somerset Street to larger quarters at 2820 North Fourth Street in Philadelphia, Penna.

Christensen and Hand Advanced

C. W. Christensen, assistant general manager of sales of the Rubber Service Department of Monsanto Chemical Company for the past few years, has been promoted to general manager of sales of that department, succeeding the late Edward J. Smail, Jr. James F. Hand, of the Rubber Service sales department, has been named to occupy Mr. Christensen's former position as assistant general manager of sales. Both announcements were made last month by G. Lee Camp, vice-president of Monsanto. Mr. Christensen has been with Rubber Service since 1922, while Mr. Hand joined the company in 1930. Mr. Christensen is also treasurer of the Rubber Division, A.C.S.

C. W. Christensen James F. Hand

According to Frank Grillo, international secretary-treasurer of the United Rubber Workers of America, that union now has more than 68,000 paid-up members. This is an increase of more than 4,000 over the claim made last year.

J. J. Berliner & Staff, 225 Fifth Ave., New York City, has issued a bulletin under the title, "Mailing Lists for Latin America." Copies are available without cost on request.

Goodrich has leased a floor in the building at 1790 Broadway in New York City, the former U. S. Rubber Building, for offices. A floor at 110 West End Avenue was also leased for a retail sales department and warehouse.

Stockholders of U. S. Rubber have been called to a meeting on July 8 to act on proposed amendments to the company's charter to enable it to widen its activities by undertaking the manufacture of munitions and other related items for national defense.

Sidney Albert, of L. Albert & Son, dealers in rebuilt and second hand rubber machinery, with shops and warehouses in Trenton, Akron and Los Angeles, has donated a large laboratory mill to the University of Akron. The mill will be delivered shortly.

CANADIAN NEWS

For the first time in any month this year, imports of crude rubber into Canada in April were less than they were for the same period in 1940. Imports in April amounted to 5,669,217 pounds compared with 6,934,823 pounds in April, 1940. Total imports for the first four months of the year are well ahead of last year, however, amounting to 36,901,246 pounds against 31,690,594, an increase of 16.4 per cent.

Canadian rubber manufacturers are expecting the Dominion government to impose restrictions on civilian use of rubber, following the adoption of a similar policy in the United States. Although Canada does not get its rubber through New York it seems likely that if shipping is not available to carry full supplies to the United States it is likewise unavailable for carrying rubber supplies to Canada.

According to information from Ottawa, the freezing of wages in all Dominion war industries, including the rubber industry, is imminent. The plan is being strongly pushed by the Department of Labor and calls for immediate stabilization of wage scales at present levels with provision for cost of living bonuses. By such legislation it is hoped to stop the inflationary rise of prices threatened by the frequent increases in wage scales made by war industries to avoid strikes or slowdowns.

Seiberling Rubber Company of Canada, Ltd., Toronto, is building a large addition to its plant in order to take care of greatly increased business, according to R. J. Thomas, president.

The new building will be one hundred feet square and two stories high and will cost approximately $100,000. It will be used principally as a warehouse and office and the former office space will be used for production purposes.

Seiberling's part in the war effort during the past year has included the manufacture of $1,000,000 worth of special tires and tubes for the British forces. In addition, the company has on hand similar orders amounting to $500,000.

Sidney R. Skelton, advertising manager of the Goodyear Tire and Rubber Co. of Canada, Ltd., New Toronto, has been elected a director of the Toronto Advertising and Sales Club.

Directors of the Dunlop Tire and Rubber Goods Company, Ltd., Toronto, declared a dividend of two and one-half per cent on the first preference shares for the half year ending June 30.

Gutta Percha and Rubber Company, Ltd., Toronto, has recently published a booklet illustrating the badge designs used by all of the Canadian forces. The new booklet is similar in format to one issued last year which reproduced all medals and ribbons, badges of rank and flags of the British Empire.

E. J. Hayes, of Gutta Percha and Rubber, has been elected a director of the Industrial Advertisers Association of Ontario.

J. I. Simpson, president of Dunlop, has been named to the executive committee of the Toronto branch of the Canadian Manufacturer's Association.

Contracts in excess of $5,000 awarded by the War Supply Board, Ottawa, to Canadian rubber manufacturers during the period April 21 to May 16 included the following: for clothing, to Viceroy Manufacturing Co., Ltd., Toronto, $7,800 on April 25; to Miner Rubber Co., Ltd., Granby, Quebec, $82,480 on May 16; to Canadian General Rubber Co., Ltd., Galt, Ontario, $21,385 on May 16; to Kaufman Rubber Co., Ltd., Kitchener, Ont., $21,385 on May 16.

For personal equipment: to Dominion Rubber Co., Ltd., $74,072 on April 25; to Miner Rubber Co., $82,500, and to B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, $30,476, on May 2.

For land transport: to Goodyear Tire and Rubber Co. of Canada, Ltd., $12,120 on May 2 and $464,348 on May 9; to Firestone Tire and Rubber Co. of Canada, Ltd., Hamilton, Ont., $191,074 on May 9; and to Dunlop Tire and Rubber Goods Co., Ltd., Toronto, $76,064 on May 9 and $5,765 on May 16.

Goodyear Tire and Rubber Company, Ltd., New Toronto, was the only representative of the Dominion rubber industry to gain a place on the honor roll of Canadian firms purchasing $500,000 or over of Victory Loan Bonds in the recent campaign. Goodyear purchased bonds to the extent of an even $500,000. Two other companies that can not be regarded strictly as members of the rubber industry but also won places on the honor roll were Canada Wire and Cable, with a purchase of $500,000, and Northern Electric, $1,000,000.

A. G. Partridge, president of Canadian Goodyear, states that total sales and earnings of the company for the first half of 1941 "compare very favorably with the same period of 1940." Holders of the company's preferred shares have responded to the requests for tenders of preferred shares to such an extent that it will not be necessary to issue any call for redemption. Holders of these shares were asked a month ago to tender them for redemption by the company in accordance with provisions of this stock.

B. M. Costello, factory manager of the B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., sprained an ankle recently while playing golf in Akron and has since been sporting crutches and a plaster cast. Reports are being circulated to the effect that Mr. Costello, who not long ago became a father for the first time, resorted to these extreme measures to get out of the customary floor-walking.

Calvin Yoran

Calvin Yoran, recently elected vice-chairman of the Chicago Group, Rubber Division, A.C.S., was born in Chicago on March 5, 1908. He attended the University of Chicago, receiving his B.S. in 1930 and his Ph.D. in 1933. He joined the Featheredge Rubber Company of Chicago in 1933 and is still associated with that company in the capacity of chief chemist. Dr. Yoran is a member of the American Chemical Society and, of course, of both the Chicago Section and the Chicago Group of the Rubber Division of that Society. He is also a member of the Chemical Arts Forum. His hobbies include photography, stamp collecting, golf and tennis.

Symposium on Time Controllers

The June, 1941, issue of *Instruments*, published by the Instruments Publishing Co., 1117 Wolfendale St., Pittsburgh, Penna., is devoted to a Symposium on Automatic Time Controllers. The types of controllers made by more than fifty separate companies are illustrated and described. Technical features of each type are stressed.

LOS ANGELES NEWS

A capacity crowd of 48 tried and true fishermen from the ranks of the Los Angeles Rubber Group took the planned jaunt into the waters around Santa Catalina Island on Saturday, June 21. The group left the mainland on the evening of June 20, stayed all night on the island, and then did their fishing all in one day—two days would have caused the water line to drop too much from poundage removed. This was the sixth annual fishing trip the group has taken.

An unusual number of valuable prizes was offered this year. First prize for largest fish (too large to describe here) went to Eugene Hedrick (U. S. Rubber); for second largest, Louis G. Konig (Meldowney & Martin); for first sport fish caught, R. M. LeRoy (Goodrich). Each of these prize winners received a fishing rod with reel and line. L. Jung (U. S. Rubber) won a combination 22-calibre rifle and 4-40 shotgun for guessing the number of sport fish caught during the day. The prizes were made possible through the cooperation of the following:

American Cyanamid, Arrowhead Lime, Robert Badenhop, L. H. Butcher, California Hardware, Cutler-Hammer, Dill Manufacturing, B. E. Dougherty, DuPont, C. P. Hall, J. M. Huber, Johnston Steel & Wire, Marshall Dill, Martin, Hoyt & Milne, Meldowney & Martin, H. Muehlstein, National-Standard, H. M. Royal, Schrader, Western Insulated Wire, Western Shade Cloth, William Clarke, Winne & Sutch, and the San Francisco Sulphur Co.

Business is so good for the Darnell Corporation, Long Beach, that the number of employees in the rubber plant has been increased from 18 to 45 and in the down-town plant from 55 to 105.

The Meldowney and Martin Company at Wilmington has moved from its old offices in the Wilmington Transfer Building to new and larger offices at 119 W. Anaheim Boulevard, Wilmington. Louis Konig is in charge of the offices. The company offers an inspection and weighing service on imports.

The Pacific Rubber and Tire Company at Oakland has resumed operations at full capacity after having been tied up for a time with a strike.

Ed. Caram of the Caram Manufacturing Company is in the process of building himself a new home.

Ed. Royal left Sunday, June 29, on his regular business trip up the coast. The trip always takes him to San Francisco, Portland, Seattle, Tacoma, and to a few islands in Puget Sound famous for fish.

The Bettis Rubber Company, Ltd., mentioned last month as being organized for business in the oil field specialty manufacturing game, with B. H. Barnes, P. H. Lester and Charley Lamb, Jr., as the principals, is now all set at 1557 S. Esperanza Avenue.

J. R. Morath, sales representative of Naugatuck Chemical, was in Los Angeles for a week in June and went north from here to San Francisco. He was accompanied by his wife. Mr. Morath is connected with the technical sales division of his company and travels the mid-western states.

The MacClatchie Manufacturing Company, Compton, is moving into a new building and has installed a large amount of new equipment.

A. B. ("Red") Cleaves, who was connected with the personnel department of Goodyear here for fourteen years but who more recently has been personnel manager of the company's factory in Argentina, spent some time during the month of June in Los Angeles visiting old friends. He will return soon to South America.

Carl Stentz, head of the Latex Seamless Products Company, says his company is literally swamped with work, but he is worrying a bit about the requested 20 per cent cut in crude rubber consumption.

Floyd Haynes has been named manufacturers' agent for the Faulhaber Rubber Company's products in San Francisco and according to the home office he is doing a big business. This company is crowded for space, Carl Faulhaber says, due to increased demand for its products. A fire station landing mat, a product to cushion the impact when a fireman slides down a pole at a fire station from the second to the first floor, is a new product.

Labor Turnover Discussed

An analysis of labor turnover in the rubber industry, based on reports received from 47 identical establishments, employing nearly 59,000 workers in 1939 and 61,000 in 1940, or approximately 50% of the total employment in the industry, is the subject of Edition No. 26, dated May, 1941, of "Part 10—Rubber and Its Products" of the Industrial Reference Service. Copies of this edition are available from the Bureau of Foreign & Domestic Commerce at 10c each. Annual subscription to the rubber series is $1.00.

Koroseal "Blackout" Coat

Complete protection for those who venture out on dark nights is provided in the ingenious "blackout" coat, made of Koroseal, pictured here. Presented

by a New York designer, the coat has white sleeves and hood for added visibility, while the patriotic symbol at the hood base is a bicycle reflector to make the wearer instantly visible to approaching motorists.

Change in Corporate Structure

The General Atlas Carbon Company, manufacturers of Gastex and Pelletex blacks, is affiliated with the Cities Service Company, which was owned by the late Henry L. Doherty. In settling the Doherty estate it has been found expedient to merge the operations of General Atlas with those of the parent company. A new corporation, General Properties Co., Inc., has been formed and the General Atlas Carbon Company, as of July 1, will henceforth be known as the General Atlas Carbon Division of General Properties Co., Inc. No change has been made in the operations of the new division, the executive offices of which remain at 60 Wall Street, New York City. Carl J. Wright, president of General Atlas Carbon Co., continues as general manager of the new division.

Seeks Golf Ball Equipment

Bernard Weinberg, of the Golfer's Supply Co., 318 West 9th St., Los Angeles, California, is contemplating the manufacture of golf balls and is interested in receiving catalogs and prices of essential equipment, as well as prices and samples of balata, compounding ingredients, and other raw materials. Data should be sent to Mr. Weinberg's attention.

OBITUARIES

Dr. Charles M. Knight

Dr. Charles Mellen Knight, one of the nation's outstanding educators in the field of chemistry, credited with having founded the first course in rubber chemistry in any American college, and one of the organizers of the Rubber Division of the American Chemical Society, died at his winter home in Coral Gables, Florida, at the age of 93, on July 3. He was active until he became bedridden just two weeks before his death.

Although Dr. Knight achieved eminence in the science of chemistry he began his career as an engineer and a railroad builder, helping to build some of the first roads to span the then wild west. He was born in Dummerston, Va., attended Westbrook Seminary at Deering, and was graduated from Tufts College with an A.B. degree in 1873. After being graduated he entered the railroad business but later forsook this field of endeavor for college teaching.

Characteristic of his energy, Dr. Knight prepared himself for his new field by taking graduate courses at Harvard University and the Massachusetts Institute of Technology. After a brief period of teaching at Goddard Seminary at Barre, Vermont, and at his alma mater, he came to Buchtel College in 1875 as professor of natural sciences. He later became head of the college's department of chemistry and physics, and served as dean from 1902 to 1913. During this period he instituted a course in rubber chemistry.

Among the noted men who studied under Dr. Knight was Dr. H. E. Simmons, now president of Akron University.

Frederick W. Kramer

Frederick William Kramer, factory manager of the Northern Rubber Co., Guelph, Ontario, Canada, since 1920, died recently from pneumonia. Born in Colchester, Conn., in February, 1870, Mr. Kramer began his career as a shoemaker with the Granby Rubber Co., subsequently becoming cutting room foreman and later factory superintendent. In 1912 he joined the Dominion Rubber Co. at St. Jerome, Quebec, as factory manager. Mr. Kramer was a member of the Knights of Columbus. A widow, two daughters and one son survive.

Arthur J. Davis

Arthur Jones Davis, purchasing agent and director of the Goodyear Footwear Corp., Providence, R. I., and secretary-treasurer of the Rhode Island Rubber Club, died at his summer home in Acton, Maine, at the age of 57, on July 1. He had had a long and distinguished career in the rubber industry. In addition to his duties with the Rhode Island Rubber Club, Mr. Davis was an active member of the Rhode Island Purchasing Agents' Association. He was also a member of the Orpheus Lodge of Masons. Funeral services were held at the Ray O. Page Funeral Home in Providence on July 3, with interment in North Burial Ground.

Robert T. Howes

Robert T. Howes, development engineer for the Goodyear Tire & Rubber Co., died on June 8 at the St. Thomas Hospital in Akron, Ohio, at the age of 44, following an illness of several months. A lifelong resident of Akron, Mr. Howes was graduated from St. Vincent's High School and joined Goodyear in 1916. He had traveled around the world in the interest of that organization and recently acted as national defense contact engineer for the company. Funeral services were held on June 11, with interment in St. Vincent's Cemetery.

Mrs. Emma O. Woolery

Mrs. Emma O. Woolery, wife of R. D. Woolery, president of the Polson Rubber Co., Garrettsville, Ohio, died at the Cleveland Clinic in Cleveland, Ohio, on June 25, from self-inflicted wounds. Death came several hours after she was brought to the hospital by Mr. Woolery. Besides her husband, she is survived by a son, Philip, a freshman at Purdue University.

Mrs. Ada R. Smith

Mrs. Ada R. Smith, wife of Franklin G. Smith, president of the Ohio Rubber Co., Willoughby, Ohio, died at her home at the Alcazar, Cleveland, on June 21, after a long illness. Funeral services were conducted in Wade Chapel on June 23. Private burial was in Lake View Cemetery.

Approve Plant Expansions

The War Department moved late in June to finance a $2,266,000 expansion in defense production facilities at four Akron plants. Goodrich will get an allotment of $1,500,000 for equipment to build tires and tubes for army cars and trucks; Goodyear, $500,000, for jigs and tools to build airplane nose-wheel assemblies; General Tire, $165,000, for jigs, dies, tools, fixtures and equipment to build tires; Firestone, $100,000, for jigs, dies and fixtures to build a special dual-seal airplane tire to be both blow-out and puncture proof. The allowances herald a tremendous defense material order to come.

High M. P. Paraffin Wax

The Union Oil Co., of Oleum, California, has begun the production of high melting point, fully refined petroleum waxes. These waxes have melting point ranges of 145° to 150° F.-amp, and 160° to 165° F.-amp. Employed primarily as waterproofing agents for paper containers, wrappings and cardboard cartons, the waxes also find application as rubber softeners. Due to their high tensile strength and small crystalline structure, these domestic waxes are said to be superior to the high melting point crystalline waxes formerly imported from Burma and Sumatra. Known as "Aristo" waxes, they will be marketed throughout the Eastern United States by Petroleum Specialties, Inc., 570 Lexington Ave., New York City.

Hits Synthetic Rubber Claims

A charge that "the American public has been fooled about synthetic rubber possibilities," was made by Dr. Ernst A. Hauser, of M.I.T., in a paper delivered at Gibson's Island, Baltimore, Md., on July 7, during a symposium on organic high molecular weight compounds. Dr. Hauser said there was no sense to statements that the American petroleum industry, given 18 to 24 months, could supply sufficient synthetic rubber to meet our annual domestic demand. He also referred to processing difficulties, should such exaggerated claims be fulfilled. His statements were not disputed by Akron rubber officials who pointed out that the argument is theoretical and, as yet, could not be debated on practical grounds.

Offer New Type Rubber Filler

Agicide Laboratories, Inc., Milwaukee, Wisconsin, is currently offering English walnut shell flour as an organic filler for rubber. The material is available in three grades, C-200, C-250 and C-325, the numbers referring to mesh sizes. The specific gravity of the flour is 1.25 to 1.46, and it weighs between 26 and 34 pounds per cubic foot, depending upon the fineness of the grind. It is said to be water resistant and to have good dielectric properties. According to the suppliers, English walnut shell flour improves tensile strength, elongation, flexing properties, and resistance to abrasion and aging.

New Synthetic Lauric Acid

Lauralene is the name of a new, synthetically-made lauric acid, of low titre, just introduced by the Beacon Co., 89 Bickford St., Boston, Mass. The new material has an acid number of 324 and a saponification number of 366, making it especially suitable for many applications, including rubber compounding and the production of molded plastics.

Stamford Neophax Vulcanized Oil

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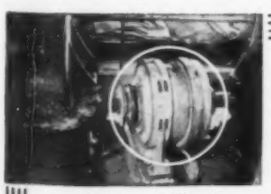

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This 24" diameter STEARNS Magnetic clutch and Brake Unit is providing smooth start and positive stop on a rubber mill in a prominent mid-western plant. Efficient, economical and safe, sizes and combination to meet requirements. Write for bulletin 225.

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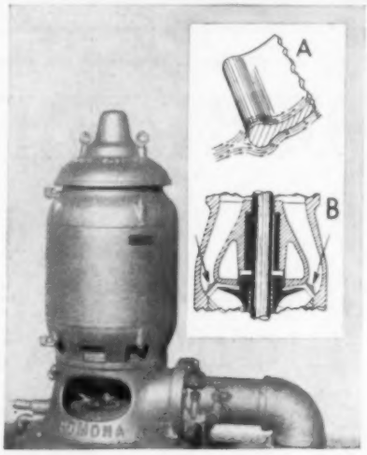
NEW EQUIPMENT

Pomona Vertical Turbine Pumps

Patents covering design improvements which eliminate hydraulic losses in pumps, thereby increasing efficiency as much as 10%, have recently been granted to the Pomona Pump Co., of St. Louis, Mo., and Pomona, Calif. These improvements, now incorporated



in all sizes of the company's vertical turbine pumps, involve fundamental changes in the guide vanes, the function of which is to alter—from horizontal to vertical—the flow direction of fluids being pumped.

Previous practice in pump manufacture dictated that these guide vanes can be constructed as thin as possible on the advance edge, on the theory that the less metal the fluid would strike, the less would be the resistance encountered. However, it was discovered by Pomona engineers that, because fluid being discharged by the impeller element flows across the guide vanes at various angles (instead of always directly across the advance edge), eddy-friction losses are encountered, reducing the efficiency of the pump.

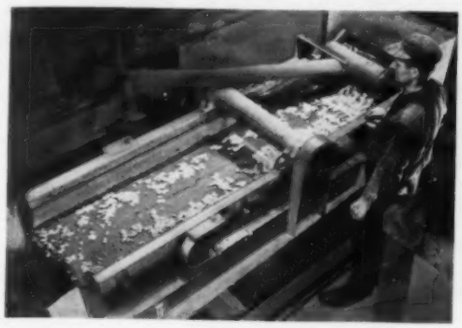
By forming these advanced vane ends of a bulbous shape, it was discovered that regardless of the flow direction of the fluid, its direction would always be substantially tangential to the vane surface. Thus, greater uniformity of flow pattern is secured, friction is reduced and efficiency of fluid lift is increased. Furthermore, because of the recessive curve at the rear of the bulb-shaped vane, eddy currents are not developed as under former circumstances.

The improvement is inherent in the pump design, so that there are no gadgets or small parts to wear out. The new vane shape increases overall operating efficiency as much as ten per cent, with no increase in the original investment, and in addition permits the high efficiency to be maintained over a broader range of capacities than is possible with ordinary turbine pumps. Moreover the broader guide vanes give increased strength because of their extra thickness.

Inasmuch as the new guide vanes are an inherent part of the pump bowl assembly, it is not necessary for the owner of a vertical turbine pump to purchase a complete new pump in order to take advantage of the new design. It is only necessary to substitute a new bowl assembly.

Recovering Rubber from Sludge

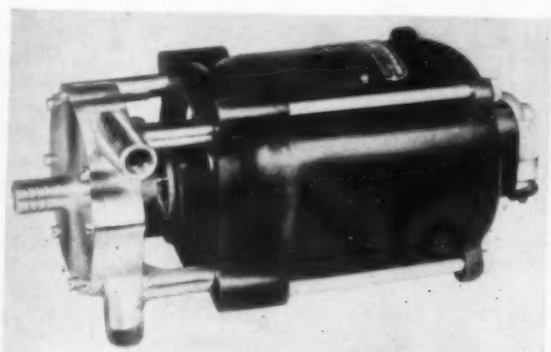
The installation of a "liquid" vibrating screen by the Link-Belt Company of Chicago, Illinois, in the plant of a manufacturer of mechanical rubber goods and rubber soles and heels has resulted in the recovery of 40 to 50 pounds of rubber per hour from sludge.



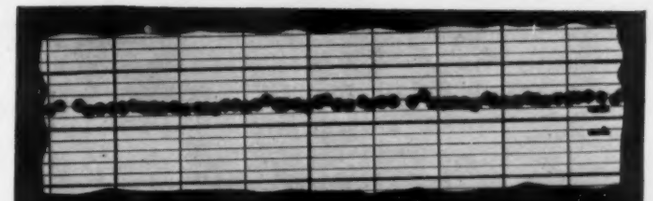
This rubber was formerly wasted. The "liquid" screen, the name given to it by the manufacturer, was equipped with 100-mesh stainless steel screen cloth. The screen handles a large volume of sludge containing particles of fine rubber which have been previously passed through a 60-mesh screen. Size of the equipment installed was 2 x 8 feet. As will be noted in the accompanying illustration, most of the liquid is removed before the material reaches the middle of the screen. Intensity of the vibration of the screen can be varied to suit conditions. The screen box vibrates, thus producing uniform vibration over the entire area of the cloth. The cloth is so supported that the flow of liquid on the underside of the cloth is prevented.

Midget Size Explosion Proof Pump

Eastern Engineering Co., 45 Fox St., New Haven, Conn., has announced the addition of a new model to its line of midget size pumps which are steadily finding new applications in industry. Main features of the new model, known as the Eastern Model "D"



Explosion Proof Pump, include its explosion proof motor, its compact size and construction, its capacity for continuous duty operation, and its performance characteristics in relation to its size, which is 10 inches long, 5½ inches high, and 5 inches wide. It weighs only 18 pounds. The new model, which has a maxi-



Baker's Controlled Temperature* supplies what Neoprene Compounders demand:

a **CALCINED MAGNESIA** *that is always* **UNIFORM**

*Temperature chart above shows unvarying temperature (never more than 5° variation) in the special, custom-built electric ovens that manufacture Baker's Light Calcined Magnesia. This is the major reason for:

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These are qualities Neoprene Compounders *must* have in a Calcined Magnesia. They are qualities you *get* in Baker's Light Calcined Magnesia. Baker, in many years of producing purity products to definite physical and chemical specifications, has learned the art of *exactness* and of manufacturing to small tolerances.

More than that, Baker has gone a step further to safeguard delivery of *uniform* Calcined Magnesia. Moisture-proof packages bring you this product with its uniform quality *maintained.*

Investigate Baker's Light Calcined Magnesia—manufactured especially for the exacting needs of Neoprene Compounders. Test it in wetting power—in ease of dispersion—stability of compounded stock—rate of cure—tensile strength and plasticity. Learn why Baker's Light Calcined Magnesia is better. Send for free samples.

Strong, 4-ply bags, asphalt-interlined and tape-sealed—and corrugated, waterproof cartons—guard against moisture infiltration.

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FREEPORT, TEXAS APOPKA, FLORIDA

mum pressure of 16 pounds per square inch and a maximum capacity of 5.7 gallons per minute, is recommended by the manufacturer for all industrial pilot plant, laboratory and experimental application where an explosion proof unit is necessary. Nozzles of the new pump are threaded for ¼-inch standard pipe fittings.

Glass-Electrode pH Indicator

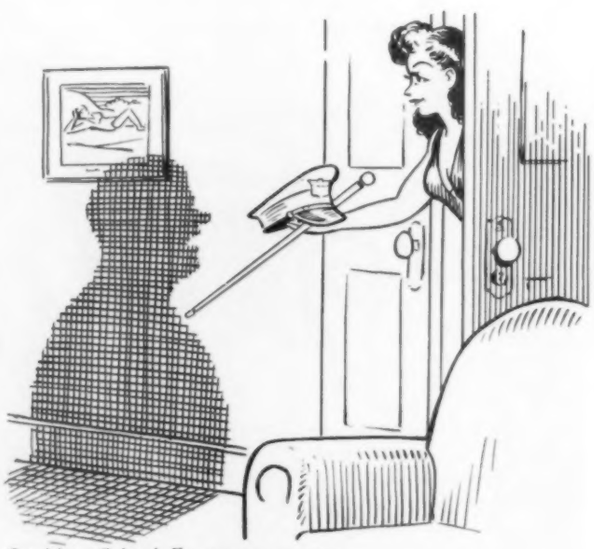
Although simplified and stripped to essentials for low cost and easy operation, a new type of Glass-Electrode pH Indicator introduced by the Leeds & Northrup Co., Philadelphia, Penna., is said to offer as much accuracy as is needed in many laboratory measurements and in practically all plant tests. According to the manufacturers, the new indicator retains full accuracy up to 85° F. in atmospheres of 95% relative humidity. Measurements can be made consistently within its limit of error of adjustment, which is plus-minus 0.1 pH.

Light in weight, well balanced, the new indicator includes everything necessary for measuring pH. Speed and convenience are inherent in its simple construction. Adjustments take but a moment. Measurements are made simply by pouring a sample into its self-contained beaker, and reading pH directly from the meter scale.

Adequately shielded, the instrument embodies a rugged deflection meter, and a thermionic amplifier of high stability. Manual temperature compensator (0 to 50° C, with 1-degree divisions) eliminates computations, saves time, prevents errors. Factory filled and sealed electrodes are highly stable.

As an extension of its recently announced line of new polyphase induction motors, the General Electric Co., Schenectady, N. Y., has introduced a new **Tri-Clad Capacitor Motor,** designed to meet a large number of varied industrial applications. Two types are available, one for applications requiring moderate starting torques and the other for those requiring high starting torque.

ADVERTISEMENT



Good-bye, Colonel. For greater resistance to the effects of aging, use HYCAR.

See page 285

Flexalyn—Plasticizer, Softener or Tackifier

FLEXALYN, a pale-colored, extremely tacky, translucent, semi-solid resin resulting from the esterification of the isomeric acids in rosin with diethylene glycol, referred to chemically as a diethylene glycol diabietate, has been introduced by the Synthetics Department of the Hercules Powder Co., Inc., Wilmington, Delaware. Because of its unusual properties, it finds application as a plasticizer, softener or tackifier in adhesives, plastics and protective coating compositions.

The physical properties of the new material fall between those of the liquid esters, Hercolyn and Abalyn, both of which find application in the rubber industry, and the hard, high-melting Pentalyns. Like these materials, it is completely soluble in almost all solvents, and it is compatible with a wide variety of resins, waxes, gums, asphalts and pitches. It is also compatible with water-insoluble film-formers and miscible with water-soluble film-formers.

Flexalyn can be described as a resin with a high refractive index. It is sticky and persistently adhesive, neutral, non-hygroscopic and water-insensitive, and is compatible with polycyclo rubber (Pliolite), Parlon (chlorinated rubber), rubber itself, latex, etc. When milled in rubber compositions it temporarily increases the softness and tack of the rubber. This effect makes it of special value for the production of various types of rubber specialties where temporary softening action can be utilized, as in the manufacture of rubber cements.

Latex films are noted for their poor mechanical adhesion. Inclusion of 20 to 30% of Flexalyn, it is said, increases the adhesion of this film-forming material to an outstanding degree. As noted, Flexalyn is completely compatible with latex and is easily incorporated in the mix.

More on Reducing Moisture Loss from Fruits

(Letter to the Editor)

YOUR article on "Reducing Moisture Loss from Fruits and Vegetables" in the December, 1940, issue of RUBBER AGE, prompts me to draw to your attention the fact that in 1925 I carried out considerable research work on the coating of fruit as a means of preserving or otherwise retarding the ripening process.

Patent specifications filed at the time covered the application of films which were non-injurious and easily digested and which in no way affected the appearance of the fruit, and yet at the same time permitted it to be eaten without the removal of the skin. However, it is to be regretted that in spite of the range of substances tried which included latex none was found satisfactory. That is, by such treatment it was not possible to retard skin shrinkage and ripening over a sufficiently long enough period to permit of export resulting in the arrival of the fruit in a fresh condition.

It should also be borne in mind that while it is easy to coat a few fruits in the laboratory any process devised must be capable of being worked on a bulk scale by the shippers, which is really where the difficulties commence.

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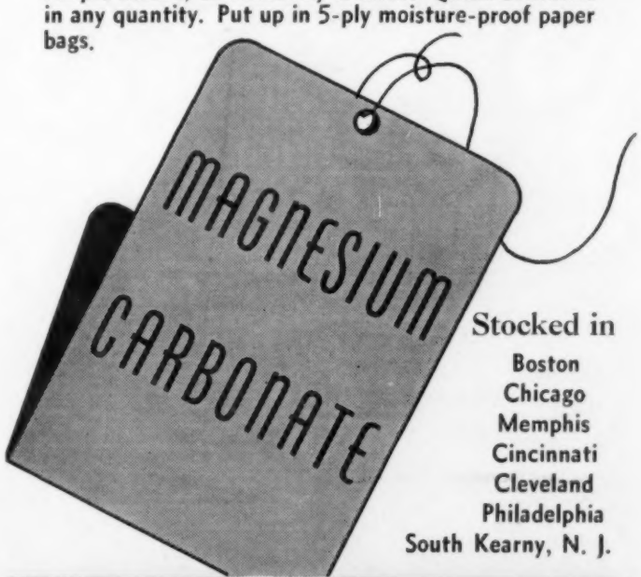

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FRANK E. RANDALL, Waltham, Mass.

REVIEWS

BOOKS

The Automobile Industry. By E. D. Kennedy. Published by Reynal & Hitchcock, Inc., 386 Fourth Ave., New York City. 5½x8¼ in. 334 pp. $3.50.

This is a story of the growth of the automobile industry, chronologically told. Although the author is a financial writer and is concerned mainly with the financial side of the industry's growth, it was inevitable that he uncover and incorporate in his story the picturesque and romantic details with which the automobile industry is saturated. It begins with the horseless carriage era of the 1890's and is carried up through the year of 1940, from the beginnings of Hiram Percy Maxim to the death of Walter P. Chrysler, who did much to aid and abet the introduction of mass production methods.

The tremendous growth of the automobile industry is indicated by some of the author's terse comments. For instance, he makes reference to the fact that 50 years ago there was not a single gasoline automobile in the United States; 40 years ago there were about 4,000; today there are some 30,000,000, more or less. As to the manufacturing trend, he points out that once there were scores of active manufacturers, with 700 different makes on record by 1916, but today the different makes can be counted on the fingers of two hands.

Naturally, the role played by several of the larger rubber manufacturers in the growth and development of the automobile industry creeps into Mr. Kennedy's story from time to time. For this reason, as well as the fact that the complete story is told in good and easily-assimilated English, *The Automobile Industry* should prove to be interesting reading to members of the rubber industry.

BOOKLETS, CATALOGS, Etc.

Accelerator 2-MT. By M. F. Torrence. (Report No. 40-1). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware. 6¼ x 9½ in. 34 pp.

This report describes the properties of Accelerator 2-MT, a new type of accelerator for rubber, and gives information on the fundamental principles to follow in developing compounds with 2-MT acceleration. One section of the report is devoted to 2-MT-808 acceleration for stocks containing reclaimed rubber. According to the booklet, the new accelerator is a white, odorless, stable powder of a high degree of purity. It has a melting point between 104 and 105° C. It has been designated as a "thiazoline" type accelerator, although it fits into no existing classification, because it is chemically 2-mercapto-thiazoline.

•

Better Built Process Equipment. (Catalog No. 101). Process Equipment Division, H. K. Porter Co., Inc., 5002 Harrison St., Pittsburgh, Penna. 8½ x 11 in. 28 pp.

This catalog describes and illustrates the complete line of agitators, mixers, digesters, kettles, ball mills, and pebble mills made by the company. Comprehensive specification tables are included, enabling the user to determine speeds, sizes, etc., best suited to his needs. Information and tables relative to capacities of dished bottom tanks, weights of materials, volume, etc., are also included.

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THESE FIGURES—THE *"QUALITY TWINS"* OF THE RUBBER INDUSTRY STAND FOR KOSMOBILE AND DIXIEDENSED WHICH IN TURN, STAND FOR THE HIGHEST DEVELOPMENT IN BLACKS FOR RUBBER COMPOUNDING.

Earnings in the Manufacture of Rubber Products, May, 1940. (Serial No. R. 1283). Bureau of Labor Statistics, U. S. Department of Labor, Washington, D. C. 6 x 9 in. 36 pp.

This report covers a recently completed wage survey in the rubber products manufacturing industry conducted by the Bureau of Labor Statistics. Earnings of workers in the tire and tube industry, boot and shoe industry, and the rubber goods industry other than these two divisions, are analyzed. The report indicates that during May, 1940, earnings of workers in the tire and tube industry averaged 92.9c an hour; in the boot and shoe industry, 58.6c an hour; and in the general rubber goods industry, 60.5c an hour. The report is a condensation of a more detailed mimeographed report of the same title which was released on March 17, 1941. Copies of either report are available on request.

•

The South American Handbook: 1941. Published by Trade & Travel Publications, Ltd., London, England. Agents for the United States, H. W. Wilson Co., 950 University Ave., New York City. 4½ x 6¾ in. 678 pp. $1.00.

This is the latest edition of the trade and travel book which is recognized as the standard guide to the countries and resources of Latin-America, including South and Central America, Mexico and Cuba. Like previous editions, it contains data by country on population, topography, climate, waterways, etc., as well as tables of monetary units, weights, measures, and the like. A large colored map is folded and inserted in the front while a number of line drawings through the book show railroads and other features. The book is of course especially of interest to export managers and those planning trips through Latin-America.

•

Directory of Texas Manufacturers. Published by Bureau of Business Research, University of Texas, Austin, Texas. 6¾ x 9½ in. 192 pp. $2.00.

Primarily compiled to facilitate the marketing of products of Texas manufacturers, to aid in the industrialization of the state, and to help the small manufacturer reach a wider market, this directory classifies all manufacturers in the State of Texas by cities and by products. Indexes to both cities and products included make the location of any particular information a simple task. The use of different colored paper stock separates the two sections effectively. The names of principal officers are given in connection with the company listings.

•

Sellstrom Eye and Face Protectors. (Catalog No. 19). Sellstrom Manufacturing Co., 615 No. Aberdeen St., Chicago, Ill. 11 x 8½ in. 36 pp.

The diversified lines of eye and face safeguards made by the company are illustrated and described in this new catalog. Included are lenses for every industrial use, helmets, hand and folding shields, goggles, respirators and visors. Other protective appliances and accessories sold by the company are also included.

•

Dangers and Health Hazards of Fire Gases. By Harold Joe Davis. Published by the Author, 3927 East Admiral Place, Tulsa, Oklahoma. 6 x 9 in. 16 pp. 25c.

The purpose of this booklet is to better familiarize those responsible for both industrial and public safety with the dangers and health hazards of fire gases. Lethal fire gases given off during the burning of many combustible materials are discussed. Reference to the burning of rubber is made.

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REVIEWS (CONT'D)

The Optical Properties of Rubber. By Lawrence A. Wood. National Bureau of Standards, Washington, D. C. 7¾ x 10½ in. 8 pp.

A reprint from the February, 1941, issue of the *Journal of Applied Physics*, this booklet discusses the optical properties of rubber under four main headings, *i.e.*, absorption, scattering, refractive index, and double refraction. A general survey of the results of previous work in each of these fields is given, while some of the possibilities for future investigation are indicated. New experimental data is presented for the transmission values of milled pale crepe and a soft vulcanized rubber compound at specific wave lengths.

•

How Inventors Can Aid National Defense. (Information Bulletin No. 2). National Inventors Council, Department of Commerce, Washington, D. C. 6 x 9 in. 24 pp.

As indicated by the title, this booklet is devoted to a brief discussion of how inventors can best aid in the National Defense Program. It outlines the purpose of the Council, the character of useful inventions, and the defense value of inventions. Included are biographical sketches of Council members, of which Webster N. Jones is one, and a break-down of the Council by technical committees.

•

Facts About White Paint and Better Illumination. Sherwin-Williams Co., Cleveland, Ohio. 8½ x 11 in. 26 pp.

The effect of paint on lighting and illumination is analyzed in this new brochure. Charts and photographs indicate how scientific plant painting contributes to efficient illumination, better working conditions, and greater output. Of special interest is a graphic specification guide which shows maintenance engineers how to prepare each surface for painting and what type of paint to use.

•

Falk Airflex Couplings. (Bulletin 8100). Falk Corporation, Milwaukee, Wisconsin. 8½ x 11 in. 20 pp.

The outstanding features of five types of the company's Airflex couplings are fully described and illustrated in this new bulletin. It contains typical installation views, a discussion of the rubber loading in shear principle, dimension drawings and tables of each type of coupling, and a section devoted to the selection of the proper coupling for specific applications.

•

The Labor Saver. (Vol. 187). Stephens-Adamson Manufacturing Co., Aurora, Illinois. 8½ x 11 in. 20 pp.

This edition of the house organ issued by Stephens-Adamson is devoted to a number of case histories involving the company's industrial products, which include conveyors, elevators and transmission equipment. The issue is replete with illustrations and covers installations made at the plants of Abbott Laboratories, Templeton Mathews Corp., and the Seaboard Construction Corp., among others.

•

DeVilbiss Spray-Painting and Finishing Systems. (Catalog IE). DeVilbiss Co., Toledo, Ohio. 8½ x 11 in. 28 pp.

This new catalog, which replaces Catalog "ID-A," covers in condensed form the complete line of standard spray-finishing equipment for industrial use made by the company. It brings all prices and specifications of the line up-to-date. Descriptions and illustrations of the various equipment available, including latex spray guns, are given.

A **Factual Survey of Automobile Usage.** Automobile Manufacturers Association, New Center Building, Detroit, Mich. 8 x 10 in. 36 pp.

Based on two special surveys, plus data taken from road use reports made by 29 states, this booklet presents a wealth of information on the uses to which automobiles are put in the main, by both industry and individuals. It is replete with charts proving that cars are used for "necessity driving," the term employed by the report to indicate the use of cars in the earning of a livelihood.

•

Analytical Methods in Rubber Chemistry. Part I. By E. H. Farmer, G. R. Tristram and J. L. Bolland. British Rubber Producers' Research Association, 19 Fenchurch St., London, E.C. 3, England. 5½ x 8½ in. 18 pp.

Listed as Publication No. 8 in the series of booklets issued by the B.R.P.R.A., this one is a reprint of an article in a recent issue of *I.R.I. Transactions.* It is devided into three parts: (1) General Analytical Considerations; (2) Determination of Nitrogen; and (3) Determination of Active Hydrogen. The work was carried out as part of the Association's program on fundamental research in rubber.

•

Oak Hytex Balloons. Oak Rubber Co., Ravenna, Ohio. 7¾ x 10¾ in. 48 pp.

The large line of toy rubber balloons featured by the company is illustrated and described in this new, colorful catalog. In addition, a new line of inflatable toys and rubber playthings, including miniature gloves and water bottles, is included. Inflation sizes and shipping weights of all balloons are given.

•

Wheelco Condensed Catalog. (Bulletin No. Z4000). Wheelco Instruments Co., 1929 So. Halsted St., Chicago, Ill. 8½ x 11 in. 12 pp.

As indicated by the title, this catalog is designed to provide the user with a convenient, condensed listing of the principal items of equipment manufactured by the company. Illustrations and descriptions of remote controllers, temperature control instruments, and portable potentiometers are included.

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See page 285

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, JULY 9, 1941

Crude Rubber

STARTING with 21.87 on June 11, the price of spot rubber on the Commodity Exchange dropped down to 21.25, low for the period, on June 16, largely due to discussions on priorities, conservation and proposals for central buying of rubber. Actual announcement of the conservation program, incorporated in General Preference Order No. M-15, and the news that the Rubber Reserve Corporation would become the sole importer of rubber into the United States, served to strengthen the market, and the belief that the dealers and importers would be allowed to continue to operate in some function, probably in the capacity of "brokers", strengthened it still further, with the result that the price began to climb again, reaching 22.25 on June 26, high for the period. The market has been lackadaisical for the past ten days, showing a slight tendency to lower prices, with the entire trade awaiting clarification of recent decisions by official Washington. Quotations in the outside market, Exchange and Singapore, follow:

As of July 9

Plantations—

Ribbed Smoked Sheets—

No. 1 Spot	—	@	.21⅜
August	—	@	.21½
September	—	@	.21¼
No. 2	—	@	.21½
No. 3	—	@	.21⅜
No. 4	—	@	.21¼
Thin Latex Crepe	—	@	.22⅞
Thick Latex Crepe	—	@	.23
Brown Crepe, No. 1	—	@	.20¼
Brown Crepe, No. 2	—	@	.20
Amber Crepe, No. 2	—	@	.20¼
Amber Crepe, No. 3	—	@	.20
Brown Crepe, Rolled	—	@	.18¼

Latex—

Normal, per lb., carload lots	—	@	.26½

Paras—

Up-River, fine	—	@	.26
Acre Bolivian, fine	—	@	.26

Balata—

Brazilian block	—	@	.13

LONDON MARKET

(London Cable Temporarily Discontinued)

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—July 9

July	—	@	10 3/32d
October-December	—	@	10 1/16d

Scrap Rubber

Dealers report continued heavy demand for scrap. Stocks have been moving in sufficiently large quantities to keep prices fairly level and it is hoped that ceiling prices will not be placed on any particular grades. There does not seem to be any lack of raw materials and dealers are hopeful this situation will continue. Current quotations follow:

(Prices to Consumers)

Auto tire peelings	ton 30.00	@31.00	
Mixed auto	ton 16.50	@17.00	
Beadless tires	ton 22.00	@23.00	
Clean solid truck tires	ton 37.50	@40.00	
Boots and shoes	ton 27.50	@28.00	
Arctics, untrimmed	ton 22.50	@23.00	
Inner tubes, No. 1	lb. .11	@ .12	
Inner tubes, No. 2	lb. .06	@ .06¼	
Inner tubes, Red	lb. .07	@ .07¼	

Reclaimed Rubber

Reclaimers are still experiencing heavy demands from practically all branches of the industry and in view of the curtailment of crude anticipate still heavier demands. As yet, no official word has been released as to the status of reclaim under the curtailment program, although a decision is understood to be pending. Prices have increased slightly on one or two grades since our last report. Current quotations follow:

Shoe

Unwashed	lb. .07	@	.07¼

Tube

No. 2 (Compounded)	lb. .09¼	@	.11¾
Red Tube	lb. .10¾	@	.11¾

Tires

Black (acid process)	lb. .07½	@	.07¾
Black, selected tires	lb. .06½	@	.06¾
White	lb. .13½	@	.14½
Truck, Heavy Gravity	lb. .08½	@	.08¾

Miscellaneous

Mechanical blends	lb. .04½	@	.05½

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb. .38	@	.38¼
Peeler, carded, 23/4/3	lb. .39	@	.39¼
Peeler, carded, 15/3/3	lb. .36	@	.36¼
Peeler, carded, 15/4/2	lb. .36	@	.36¼
Peeler, carded, 13/3/3	lb. .35	@	.35¼

CHAFERS

Carded, American, 1 1/16"	lb. .38½	@	.39
Carded, American, 1"	lb. .29	@	.39

Cotton

Cotton prices continued their upward movement in the past thirty days, but followed an erratic course. The market was extremely sensitive to reports and rumors with the result that advances and drops of as much as 30 to 40 points in the price of middling uplands on the Exchange were not uncommon. Contributing to the upward trend were unfavorable crop news from the South and West, increased trade demand, invasion of Russia by Germany, and the news that England was again in the market for American cotton. Talk of a price ceiling on cotton gray goods in official Washington helped to curb the price from time to time. The price moved into a new high today (July 9), reaching 16.02, following the announcement by the Crop Reporting Board that only 23,519,000 acres were planted to cotton as of July 1, approximately 1,000,000 less than trade estimates. Low for the period was 14.37 on June 12. Quotations for middling uplands on the Exchange follow:

	June 10	July 9		
	Close	High	Low	Close
July	13.63	15.16	15.10	15.12
October	13.81	15.46	15.25	15.37
December	13.91	15.58	15.36	15.47

Sheetings

48x40	36 in.	5.50	lb.	—	@	—
40x40	36 in.	6.15	lb.	—	@	—
40x36	36 in.	6.50	lb.	—	@	—
48x48	40 in.	2.50	lb.	—	@	—
48x48	40 in.	2.85	lb.	—	@	—
56x60	40 in.	3.60	lb.	—	@	—
48x44	40 in.	3.75	lb.	—	@	—

Ducks

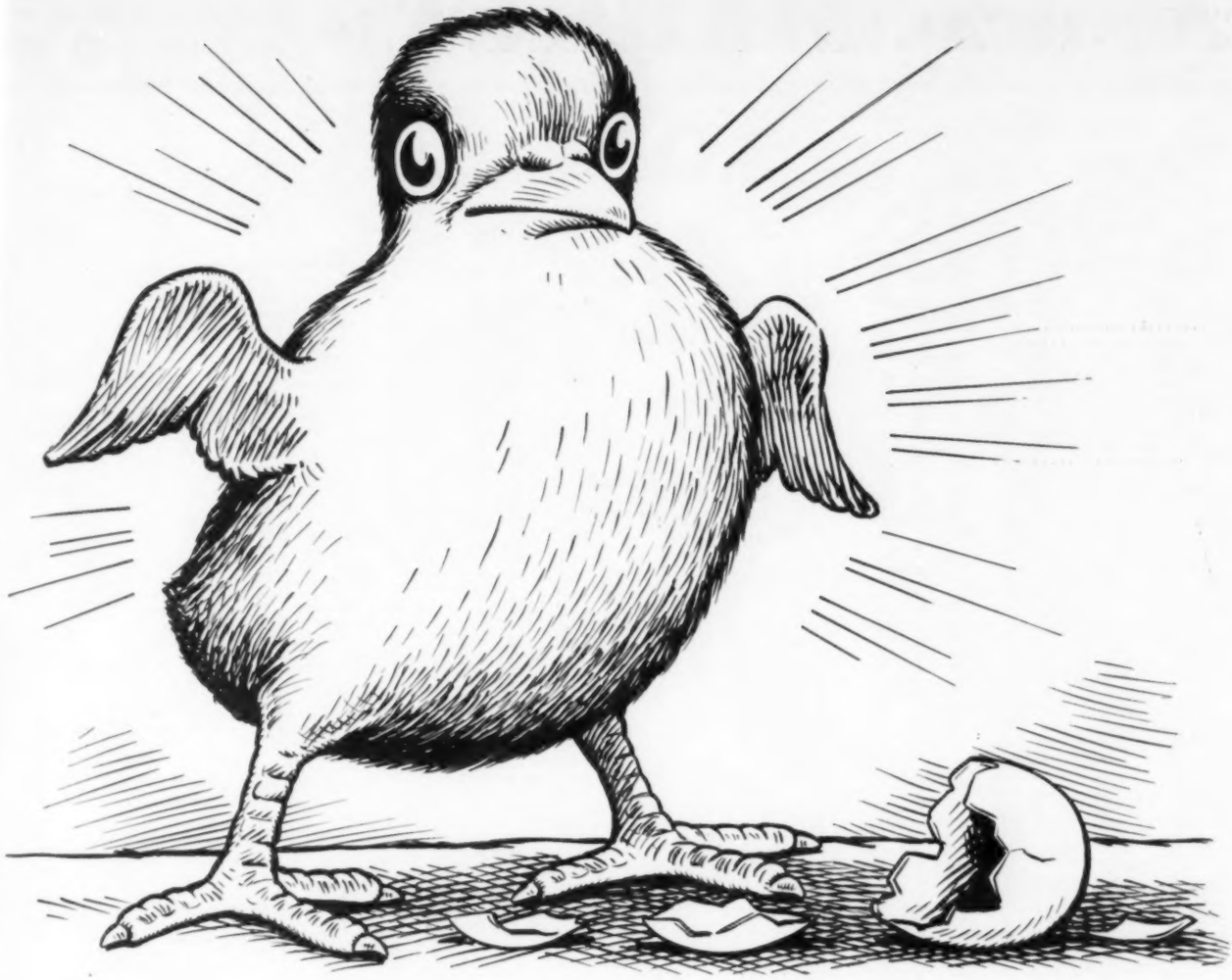
Enameling (single filling)	lb. .35	@	.38
Belting and Hose	lb. .32	@	—
Single filling, A grade	lb. .15	@	.16
Double filling	lb. .16½	@	.17

Closing Rubber Prices on New York Commodity Exchange, Inc.

"New" Standard Contract of 10 Tons

FROM JUNE 11 TO JULY 9

Date	Spot	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Sales
June 11	21.87	21.55	21.55	21.40	21.25	21.15	21.05	20.95	20.90	20.75	20.60	20.45	20.30	——	96
12	21.60	21.27	21.27	21.15	21.02	20.94	20.86	20.75	20.72	20.63	20.53	20.38	20.23	——	131
13	21.40	21.10	21.10	20.95	20.80	20.75	20.70	20.65	20.60	20.55	20.50	20.40	20.30	——	121
14	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
15	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
16	21.25	21.05	21.05	20.90	20.75	20.74	20.72	20.70	20.65	20.60	20.55	20.50	20.45	——	53
17	21.25	21.00	21.00	20.86	20.72	20.71	20.71	20.70	20.65	20.60	20.55	20.50	20.45	——	96
18	21.40	21.11	21.11	20.95	20.80	20.78	20.77	20.76	20.71	20.63	20.55	20.50	20.45	——	6
19	21.50	21.20	21.20	21.04	20.89	20.87	20.86	20.84	20.79	20.70	20.61	20.56	20.51	——	23
20	21.50	21.25	21.25	21.10	20.95	20.95	20.95	20.95	20.90	20.82	20.75	20.70	20.65	——	57
21	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
22	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
23	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
24	22.00	——	21.00	——	21.05	21.00	——	20.95	20.85	——	20.70	——	——	——	46
25	22.00	——	21.00	——	21.05	21.05	——	21.05	20.95	——	20.70	——	——	——	29
26	22.25	——	21.10	——	21.30	21.30	——	21.30	21.20	——	21.00	——	——	——	44
27	22.00	——	21.05	——	21.30	21.30	——	21.30	21.20	——	20.90	——	——	——	12
28	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
29	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
30	22.00	——	21.10	——	21.25	21.15	——	21.15	21.05	——	20.80	——	——	——	38
July 1	21.60	——	21.05	——	21.25	21.15	——	21.15	21.05	——	20.85	——	——	——	19
2	21.60	——	21.05	——	21.20	21.10	——	21.10	21.05	——	20.85	——	——	——	20
3	21.75	——	21.10	——	21.15	21.10	——	21.10	21.05	——	20.85	——	——	——	6
4	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
5	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
6	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
7	21.50	——	21.00	——	21.15	21.10	——	21.10	21.05	——	20.80	——	——	——	9
8	21.50	——	21.05	——	21.15	21.12	——	21.12	21.05	——	20.80	——	——	——	——
9	21.75	——	21.05	——	21.25	21.20	——	21.20	21.05	——	20.80	——	——	——	7



Bigger than anyone dreamed of...

SO BIG and in so short a time! Hatched less than a year ago and now grown, through your acceptance, to half a million pounds a month — with further plant expansions underway.

That's the record-breaking achievement of HYCAR O. R.*, the new and important *butadiene* type of Synthetic Rubber that offers increased resistance to oil, heat, aging and abrasion.

Ample supplies of HYCAR O. R. now are available, and through steadily increasing production we anticipate always meeting your growing commercial and defense requirements.

HYCAR
*OIL RESISTANT

HYDROCARBON CHEMICAL & RUBBER CO.
335 S. MAIN STREET, AKRON, OHIO

YOU CAN PRODUCE BETTER GOODS MORE ECONOMICALLY WITH HYCAR O. R.

CHEMICAL MARKETS

New York, July 11, 1941
All Prices F.O.B. Works

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.30
A-10	lb.	.31 @	.35
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.60
Beutene	lb.	.70 @	.75
Butyl Zimate	lb.	— @	2.15
Captax	lb.	.50 @	.55
Crylene	lb.	.40 @	.47
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.45
El-Sixty	lb.	.50 @	.65
Ethyl Zimate	lb.	— @	2.15
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.31 @	—
Guantal	lb.	.40 @	.50
Hepteen	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.13 @	—
Witco	lb.	.15 @	—
Monex	lb.	— @	1.75
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	— @	2.15
Pipsolene	lb.	1.55 @	1.80
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	2.50 @	2.75
R-23	lb.	.40 @	—
RN-2	lb.	1.40 @	1.80
RN-2 Crystals	lb.	2.00 @	2.25
Rotax	lb.	.60 @	.65
Safex	lb.	1.20 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.18 @	.20
Thiocarbanilide, drums	lb.	.24 @	.30
Thiurad	lb.	— @	2.00
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Tuads	lb.	— @	2.00
Ulto	lb.	1.25 @	1.75
Ureka	lb.	.60 @	.75
Blend B	lb.	.60 @	.75
Blend C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Zimate	lb.	— @	2.00
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Next Column)			
Blues			
Prussian	lb.	.33 @	—
Ultramarine	lb.	.16 @	.27
Browns			
Mapico	lb.	.11 @	—
Umber, Turkey	lb.	.04¾ @	.05¼
Greens			
Chrome	lb.	.21 @	.30
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	— @	—
sulfur, free	lb.	— @	—
Indian	lb.	.08¾ @	—
Domestic (Maroon)	lb.	.11 @	—
Mapico	lb.	.09¼ @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red	lb.	.09¼ @	—
Whites			
Cryptone No. 19	lb.	.05¼ @	.05½
Cryptone CB No. 21	lb.	.05¼ @	.05½
Cryptone ZS-86	lb.	.07¾ @	.08
Cryptone ZS-230	lb.	.07¾ @	.08
Cryptone ZS-800	lb.	.07¾ @	.08
Lithopone:			
Albalith	lb.	.0385 @	.0410
Azolith	lb.	.0385 @	.0410
Ray-bar	lb.	.05½ @	.05¾
Ray-cal	lb.	.05¼ @	.05¾
Rayox	lb.	.13½ @	.14¼
Titanox A	lb.	.13½ @	.13¾
Titanox B	lb.	.05½ @	.05¾
Titanox C	lb.	.05¼ @	.05½
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06½ @	.06¾
Anaconda, lead free	lb.	.06½ @	.06¾
Horsehead Lead Free Brand:			
Special—3	lb.	.06½ @	.06¾
XX Red—4	lb.	.06½ @	.06¾
XX Red—72	lb.	.06½ @	.06¾
XX Red—78	lb.	.06½ @	.06¾
XX Red—103	lb.	.06½ @	.06¾
Kadox, black label—15	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06½ @	.06¾
green label	lb.	.06½ @	.06¾
red label	lb.	.06½ @	.06¾
U. S. P.—7. bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process:			
Florence White Seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07¾ @	.07¾
Yellows			
Cadmolith	lb.	.50 @	.55
Chrome	lb.	.14½ @	—
Mapico	lb.	.06¾ @	—

BLACKS
(In bags, carload lots)

Aerfloted Arrow	.0335 @	—
Certified	.0335 @	—
Certified Spheron	.0335 @	—
Continental	.0335 @	—
Disperso	.0335 @	—
Dixiedensed	.0335 @	—
Dixiedensed 66	.0335 @	—
Excello	.0335 @	—
Furnex	.03 @	—
Furnex Beads	.03 @	—
Gastex	.03 @	—
Kosmobile	.0335 @	—
Kosmobile 66	.0335 @	—
Micronex (Amarillo)	.0335 @	—
Micronex Beads (Amarillo)	.0335 @	—
Pelletex	.03 @	—
P-33	.0475 @	—
Supreme	.0335 @	—
Thermax	.02 @	—
Wyex	.0335 @	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85	@24.50
Asbestine	ton	14.00	@18.00
Barium carbonate (98-100%)	ton	47.00	@49.00
Barytes	ton	22.85	@31.50
Bentonite	ton	11.00	@16.00
Blanc fixe, dry	ton	50.00	@62.50
Calcene	ton	37.50	@43.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.00	@60.00
heavy	ton	45.00	@55.00
Clay, Aerfloted, Suprex	ton	10.00	@22.00
Crown (f.o.b. plant)	ton	10.00	@ —
Dixie	ton	10.00	@22.50
Langford	ton	—	@ 7.50
McNamee	ton	10.00	@22.50
Par	ton	10.00	@22.50
Witco	ton	10.00	@ —
Cotton Flock (Dark)	lb.	.10½ @	.13
Kalite No. 1	ton	24.00	@50.00
Kalite No. 3	ton	34.00	@60.00
Kalvan	ton	95.00	@121.00
Magnesium carbonate	lb.	.06¼ @	.09¾
Mica	ton	35.00	@44.00
Mineralite	ton	—	@30.00
Pyrax A	ton	6.50	@20.00
Rottenstone (powd. Dom.)	ton	25.50	@37.50
Silene (calcium silicate)	lb.	.04 @	.045
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00	@25.00
Whiting, commercial	ton	16.00	@26.00
Columbia Filler	ton	9.00	@14.00
Witco	ton	6.00 @	—
Wood Flour (100 mesh)	ton	30.00	@32.00

MINERAL RUBBER

285°-300° Mineral Rubber	ton	22.00 @	—
Black Diamond	ton	25.00 @	—
Genasco, solid (factory)	ton	— @	—
Hard Hydrocarbon	ton	22.00	@42.00
Parmr, solid	ton	— @	—
Pioneer, MR, solid	ton	— @	—

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors	lb.	4.50 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.39
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sponge Paste	lb.	— @	.18
Sunproof	lb.	.23 @	.28
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61
Ty-Ply R (and S)	gal.	6.75 @	8.75
Unicel (blowing agent)	lb.	.50 @	—

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	3.18 @	3.43
Nitric, 36 degrees	cwt.	5.00 @	5.95
Acids, Fatty			
Laurex	lb.	.13 @	.15½
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.10 @	.11
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10 @	—
Alkalies			
Caustic Soda, 76%	cwt.	2.70 @	5.70
Soda Ash, 58%	cwt.	1.10 @	2.93
Oils			
Cycline Oil	gal.	.14 @	.20
Degras, bbls.	lb.	.08 @	.08½
Fluxrite	lb.	.05½ @	.06½
Para-Flux	gal.	.08½ @	.18
Para-Lube	lb.	.425 @	.48
Petrolatum, amber	lb.	.03¼ @	.04¼
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23¼
Pine, steam distilled	gal.	.54 @	.59
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol	lb.	.13½ @	.14
Rubtack	lb.	.10 @	—
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	— @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.06 @	.06¼
coal tar	ton	19.00	@22.00
hardwood	ton	16.00	@22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00	@26.00
Solvents			
Acetone, pure	lb.	.07 @	.09
Benzene, 90%, tank car	gal.	.14 @	—
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.25
Carbon, bisulfide	lb.	.05 @	.08½
Carbon tetrachloride	gal.	.66½ @	1.17
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal.	.38 @	.50
Ethylene dichloride	lb.	.0742 @	.0841
Plastogen	lb.	.07¾ @	.12
Reogen (drums)	lb.	.11½ @	.23
Rub-Sol	gal.	.09½ @	—
Trichlorethylene	lb.	.08 @	.09½
Turpentine, spirits	gal.	.48½ @	.52½
dest. dist., drums	gal.	.30 @	.36
Waxes			
Beeswax, white	lb.	.41 @	.45
Carnauba, yellow	lb.	.72 @	.75
Ceresin, white, dom.	lb.	.11 @	.15½
Montan, crude	lb.	— @	—
Paraffin			
Yellow crude scale, 124/126	lb.	.05 @	—
Refined, 123/125	lb.	.05¾ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	2.00 @	2.15
Exel	lb.	1.00 @	1.02
Gel	lb.	.57 @	.59
Hipar	lb.	.65 @	.67
Powder	lb.	.52 @	.54
Resin	lb.	.52 @	.54
Resin D	lb.	.52 @	.54
White	lb.	1.25 @	1.60
Albasan	lb.	.70 @	.75
Antox	lb.	— @	.56
B-L-E	lb.	.52 @	.61
Flectol B	lb.	.52 @	.65
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone A, B, C, D, E	lb.	.52 @	.63
Oxynone	lb.	.77 @	.90
Retardex	lb.	.45 @	.48
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

MOLD LUBRICANTS

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mineralite	ton	—	@30.00
Mold Paste	lb.	.12 @	.18
Rubberol	lb.	.13½ @	.14
Sericite	ton	65.00	@75.00
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.25 @	—
Amberex Type B	lb.	.18¾ @	—
Black	lb.	.08 @	.12
White	lb.	.08½ @	.13½
Brown	lb.	.08 @	.11½
Neophax A	lb.	.119 @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.035 @	.04
Sulfur, rubber makers			
Refined (bags)	cwt.	2.85 @	—
Commercial (bags)	cwt.	2.00 @	—
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

STATISTICS

Crude Rubber — Latex & Guayule — Reclaim — Tires & Tubes — Automobiles — Rims — Gasoline — Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1940	780,820	303,117,726	17.33	7,060	3,197,136	20.22	773,760
1940:							
April	66,622	26,176,442	17.54	565	252,638	19.98	66,057
May	47,559	18,511,955	17.38	821	301,914	16.41	46,738
June	51,074	20,019,581	17.50	623	295,334	21.15	50,451
July	66,931	26,426,632	17.63	100	49,828	22.20	66,831
Aug.	70,453	27,608,883	17.49	416	183,369	19.69	70,037
Sept.	75,770	29,317,540	17.27	666	349,443	23.43	75,104
Oct.	73,179	27,975,598	17.07	316	123,216	17.38	72,863
Nov.	69,844	26,917,136	17.21	126	52,020	18.45	69,718
Dec.	94,172	36,369,973	17.24	205	94,422	20.52	93,967
1941:							
Jan.	84,201	33,370,482	17.69	292	138,009	21.11	83,909
Feb.	70,745	28,469,753	17.97	327	144,139	19.69	70,418
Mar.	84,991	34,030,846	17.88	329	163,375	22.19	84,662
Apr.	61,288	24,193,639	17.62	238	99,371	18.96	61,054

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1924-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Liquid Latex (1) Tons	Liquid Latex (1) Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	...	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,232	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1940	3,634	758,007	648	300,500	7,451	2,449,137	33,789	14,593,466
1940:								
April	314	65,313	50	18,289	506	176,064	3,763	1,608,156
May	289	57,578	60	20,503	495	158,713	3,584	1,523,879
June	365	74,957	47	10,977	390	146,196	2,451	1,004,007
July	262	53,058	65	20,553	336	115,599	2,281	993,411
Aug.	297	59,464	61	22,638	701	276,642	2,278	1,022,531
Sept.	250	49,845	40	19,245	712	246,641	2,953	1,337,487
Oct.	381	77,286	70	38,092	1,150	382,168	1,156	512,153
Nov.	392	78,587	67	43,939	445	152,297	2,308	1,169,086
Dec.	278	62,586	54	39,471	1,102	341,876	3,534	1,539,957
1941:								
Jan.	447	104,128	57	32,910	698	221,911	2,184	1,019,741
Feb.	283	65,942	41	22,790	768	245,732	2,946	1,279,648
Mar.	426	98,187	36	16,147	715	258,514	1,707	774,225
Apr.	423	95,916	64	18,533	514	189,520	1,594	648,217

(1) Weight given in pounds of dry rubber contained in latex.
Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Including Latex)

	Figures on Monthly Basis: 1934	1935	1936	1937	1938	1939	1940	1941
Jan.	39,190	46,636	48,631	50,879	31,265	47,387	58,061	65,989
Feb.	40,515	42,720	36,841	51,950	25,357	43,422	52,078	62,692
Mar.	47,003	42,153	42,813	54,129	32,389	51,416	52,454	69,024
Apr.	44,853	44,247	52,031	51,859	29,730	45,268	52,361	71,374
May	42,918	41,101	50,612	51,795	30,753	45,484	54,513	71,187
June	40,147	36,156	52,772	51,860	32,540	48,438	47,834	
July	32,553	35,917	48,250	43,703	34,219	44,975	48,354	
Aug.	33,216	38,775	46,777	41,506	40,552	51,740	53,307	
Sept.	30,258	37,086	46,449	43,945	40,183	51,402	52,469	
Oct.	31,253	41,969	49,637	38,754	42,850	57,155	59,644	
Nov.	34,748	42,310	50,433	34,025	49,050	55,677	57,716	
Dec.	36,569	42,474	49,754	29,195	48,143	49,636	59,709	
Tot.	453,223	491,544	575,000	543,600	437,031	592,000	648,500	

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks	Year	Production	Consumption Tons	Consumption % to Crude	Stocks
1931	129,690	123,000	35.1	21,714	1936	150,571	141,486	24.6	19,000
1932	75,656	77,500	23.3	16,334	1937	185,033	162,000	29.8	28,800
1933	93,587	85,000	21.2	17,780	1938	122,400	120,800	29.9	23,000
1934	108,162	100,855	22.3	20,000	1939	186,000	170,000	28.7	25,250
1935	122,948	117,523	23.9	17,000	1940	208,971	190,244	29.3	32,636
1940: (Figures on Monthly Basis)									
Jan.	19,239	16,341	28.1	27,089	July	14,299	14,539	30.1	27,129
Feb.	17,938	15,629	30.0	27,962	Aug.	17,161	14,464	27.1	28,526
Mar.	17,182	16,200	30.9	27,524	Sept.	16,379	14,835	28.3	29,039
Apr.	16,518	16,573	31.7	26,492	Oct.	19,300	16,807	28.2	30,816
May	17,499	15,984	29.3	27,141	Nov.	17,636	16,312	28.3	31,459
June	16,581	15,163	31.7	27,701	Dec.	19,239	17,397	29.1	32,636
1941:									
Jan.	20,413	19,086	28.9	33,380	July	.....	.....	...	.....
Feb.	19,506	18,222	29.1	33,654	Aug.	.....	.....	...	.....
Mar.	22,006	19,611	28.4	35,028	Sept.	.....	.....	...	.....
Apr.	21,574	20,427	28.6	35,336	Oct.	.....	.....	...	.....
May	22,775	21,353	30.0	35,921	Nov.	.....	.....	...	.....
June	.....	.....	...	.....	Dec.	.....	.....	...	.....

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures. The annual figures are more accurate. Stocks shown are those on hand at the end of the indicated month or year.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1939*	1940	1941		1939*	1940	1941
January	38,089	40,370	45,344	August	54,025	55,346	.....
February	34,928	37,557	42,253	September	49,505	52,297	.....
March	43,042	44,607	48,606	October	49,854	53,807	.....
April	44,264	47,683	55,105	November	47,407	49,074	.....
May	49,766	52,946	.....	December	43,807	46,413	.....
June	50,133	55,459	.....				
July	50,689	53,865	.....	Total	555,509	589,424	.....

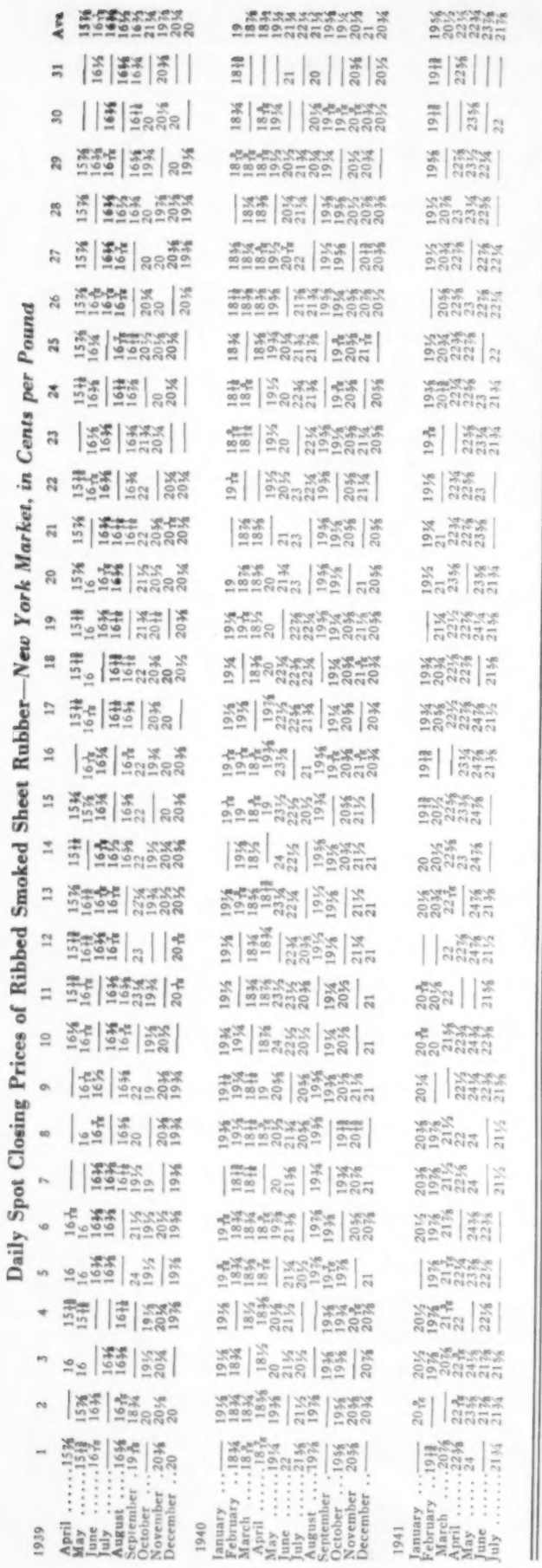
* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1929	24,141,502	1933	8,713,962	1937	22,257,664
1930	17,364,096	1934	12,255,118	1938	10,612,138
1931	11,253,800	1935	18,664,107	1939	17,471,914
1932	6,261,336	1936	20,790,192	1940	19,378,558
1941		1941		1941	
January ...	2,032,121	May	2,407,864	September .	.....
February ..	2,131,211	June	2,308,986	October ...	.....
March	2,665,961	July	.....	November .	.....
April	2,682,225	August	.....	December ..	.... ..

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*



Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.70	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49
1917	72.23	1921	16.36	1925	72.46	1929	20.59	1933	5.96

Average Monthly Price per Pound Since 1933

	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	9.32	13.10	14.35	21.37	14.63	15.75	19.06	19.88
Feb.	10.45	12.92	15.48	21.33	14.71	15.93	18.83	20.43
Mar.	11.01	11.51	15.89	24.09	13.55	16.26	18.58	22.17
Apr.	12.10	11.55	15.98	23.44	11.84	15.87	19.16	22.74
May	13.26	12.05	15.62	21.14	11.57	16.07	21.21	23.90
June	13.51	12.57	15.85	19.29	12.57	16.37	22.20	21.88
July	14.60	12.10	16.49	18.86	15.37	16.51	21.12	
Aug.	15.47	11.98	16.25	18.37	16.08	16.67	19.62	
Sept.	15.36	11.55	16.46	18.55	16.15	21.24	19.28	
Oct.	13.96	12.62	16.55	16.28	16.89	19.89	20.33	
Nov.	13.04	13.15	17.97	14.60	16.24	20.21	21.04	
Dec.	12.98	13.28	20.01	15.41	16.05	20.01	20.76	
Average for Year	12.92	12.37	16.41	19.39	14.64	17.57	20.10	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1941 Apr.	1941 May	1941 June	1941 July	Day	1941 Apr.	1941 May	1941 June	1941 July
1	14 1/8	14	——	——	16	14 3/16	14 1/16	——	——
2	14 1/8	14	——	——	17	14 5/8	——	——	——
3	14 1/8	——	13 7/16	——	18	14 1/2	——	——	——
4	14 5/8	——	13 1/2	——	19	——	14	——	——
5	——	——	13 5/8	——	20	——	13 11/16	——	——
6	——	——	13 5/8	——	21	14 7/16	13 7/8	——	——
7	14 3/8	——	——	——	22	14 7/16	13 7/8	——	——
8	14 1/4	——	——	——	23	14 3/16	13 1/2	——	——
9	14 1/4	——	——	——	24	14	——	——	——
10	14 3/8	——	——	——	25	14	——	——	——
11	——	——	——	——	26	——	13 5/8	——	——
12	——	——	——	——	27	——	13 5/8	——	——
13	——	——	——	——	28	14	13 7/8	——	——
14	——	——	——	——	29	13 7/8	13 7/8	——	——
15	14 1/2	14	——	——	30	14	13 5/8	——	——
					31	——	——	——	——

Average Monthly Price Per Pound

Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence	Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence
Jan.	7.077	7.926	11.793	12.415	Aug.	7.841	8.545	12.818	
Feb.	7.029	7.942	12.577	12.769	Sept.	7.918	9.634	11.964	
Mar.	6.590	8.120	11.651	13.967	Oct.	8.355	10.177	11.813	
Apr.	5.793	7.910	10.980	14.228	Nov.	8.111	11.210	11.801	
May	5.632	8.002	11.600	13.670	Dec.	8.005	11.559	11.963	
June	6.147	8.216	13.046	——	Average for Year	7.164	8.959	12.035	
July	7.464	8.271	12.410						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1941 May	1941 June	1941 July	Date	1941 May	1941 June	1941 July	Date	1941 May	1941 June	1941 July
1	11.73	——	15.43	11	——	14.46		22	13.41	——	
2	11.78	13.58	15.43	12	12.54	14.37		23	13.60	15.50	
3	12.05	13.77	15.40	13	13.26	14.57		24	13.61	15.35	
4	——	13.78	——	14	13.31	14.63		25	——	15.30	
5	11.97	13.74	15.45	15	13.22	——		26	13.63	15.53	
6	12.29	13.84	——	16	13.29	14.69		27	13.58	15.80	
7	12.34	14.01	15.77	17	13.33	14.95		28	13.58	15.33	
8	12.33	——	15.92	18	——	14.79		29	13.53	——	
9	12.59	14.05	16.02	19	13.31	14.92		30	——	15.24	
10	12.63	14.21		20	13.39	15.03		31	13.55	——	
				21	13.47	15.13					

Average Monthly Price Per Pound

	1938 Cents	1939 Cents	1940 Cents	1941 Cents		1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	8.57	8.94	11.19	10.66	Aug.	8.41	9.30	9.84	
Feb.	8.91	8.97	11.10	10.87	Sept.	8.17	9.30	9.69	
Mar.	8.92	9.00	10.90	11.08	Oct.	8.61	9.24	9.62	
Apr.	8.76	8.87	10.89	11.48	Nov.	9.08	9.73	9.97	
May	8.50	9.56	10.33	12.97	Dec.	8.72	10.97	10.18	
June	8.38	9.88	10.72	14.66	Average for Year	8.66	9.46	10.40	
July	8.85	9.71	10.42						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1939	ON HAND 1940	ON HAND 1941	AFLOAT 1939	AFLOAT 1940	AFLOAT 1941	TOTAL 1939	TOTAL 1940	TOTAL 1941
Jan.	220,727	139,304	309,411	48,210	90,285	153,169	268,937	229,589	462,580
Feb.	207,882	129,023	320,372	55,814	112,257	136,955	263,696	241,280	457,327
Mar.	201,752	134,871	338,147	55,981	113,619	140,228	257,733	248,490	478,375
Apr.	188,074	152,645	329,767	57,918	102,557	153,484	245,992	255,202	483,251
May	187,980	148,881	364,107	54,046	109,364	147,459	242,026	258,245	511,566
June	173,493	154,313		51,274	119,138		224,767	273,451	
July	165,450	175,455		52,990	139,629		218,440	315,084	
Aug.	152,029	194,760		66,717	141,286		218,746	336,046	
Sept.	136,824	220,597		68,310	137,888		205,134	358,485	
Oct.	119,404	235,353		100,500	166,837		219,904	402,190	
Nov.	105,205	250,412		114,044	158,095		219,249	408,507	
Dec.	125,800	288,864		91,095	145,950		216,895	434,814	

Note: Above figures include stocks held by United States Government.

STOCKS OUTSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Singapore and Penang	Para and Manaos	United Kingdom	United States	Total
April	42,239	2,715	25,000*	162,282	232,236
May	32,731	1,743	25,000*	161,446	220,920
June	32,375	1,706	25,000*	168,235	227,316
July	36,716	1,667	25,000*	190,222	253,605
August	40,395	1,580	25,000*	212,774	279,749
September	29,069	2,559	25,000*	241,538	298,166
October	33,613	3,084	30,000*	259,140	325,837
November	33,778	3,697	30,000*	276,943	344,418
December	26,773	2,165	35,000*	318,486	382,424
1941					
January	37,145	2,151	40,000*	340,857	420,153
February	46,913	2,510	40,000*	353,733	443,156
March	41,026	2,000*	40,000*	373,581	456,607

* Estimated.

STOCKS INSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Malaya	N.E.I.[1]	Ceylon [1]	Other *	Total
April	50,656	43,897	9,811	4,706	109,070
May	45,715	45,622	8,425	4,785	104,547
June	45,618	42,665	10,426	4,205	102,914
July	43,850	37,387	9,433	4,529	95,199
August	39,950	38,251	9,771	4,256	92,228
September	44,730	39,614	9,384	4,124	97,852
October	42,239	37,720	9,158	4,407	93,524
November	43,693	39,267	11,675	3,997	98,632
December	48,787	48,622	11,850	4,124	113,383
1941					
January	47,198	45,137	.....	4,329	.....
February	55,512	48,390	.....	4,064	.....
March	44,432	46,492	.....	4,210	.....

(1) Estates and Dealers. (*) Estimated.

RUBBER STOCKS AFLOAT

	Afloat for United States	Afloat for Europe	All Other Afloat	Total Afloat
End of: 1940				
May	109,364	45,000	55,636	210,000
June	119,138	50,000	65,862	235,000
July	139,629	55,000	55,371	250,000
August	141,286	55,000	53,714	255,000
September	137,033	60,000	67,967	265,000
October	166,837	60,000	38,163	265,000
November	158,095	60,000	31,905	250,000
December	145,950	60,000	44,050	250,000
End of: 1941				
January	153,169	60,000	51,831	265,000
February	136,955	60,000	48,045	245,000
March	140,228	60,000	59,772	260,000
April	153,484	60,000	.....	.....
May	147,459	60,000	.....	.....

Note: *Total Afloat* figures are estimated at 1½ months' world shipments by the International Rubber Regulation Committee. *Afloat for U. S.* is supplied by the Rubber Manufacturers Association. *Afloat for Europe* is estimated. *All Other Afloat* is determined by subtraction.

TOTAL WORLD STOCKS

At End of:	1936	1937	1938	1939	1940	1941
January	600,479	454,249	549,762	497,665	433,841	721,575
February	599,355	445,265	565,833	479,578	429,551	730,294
March	583,318	447,856	586,666	460,723	447,472	743,231
April	567,172	428,249	586,291	438,252	465,345	755,334
May	541,871	413,134	568,158	429,979	470,981	.....
June	520,255	434,250	573,136	407,640	500,774	.....
July	519,074	445,782	580,654	418,639	547,708	.....
August	500,520	457,462	565,394	397,345	579,119	.....
September	493,585	470,768	551,447	396,867	631,888	.....
October	486,159	479,398	540,976	413,274	651,775	.....
November	466,491	493,266	512,196	395,217	659,308	.....
December	466,576	545,533	482,852	391,125	702,089	.....
Monthly Avge.	528,738	460,022	555,280	427,192	543,321	.....

Note: Figures prior to 1941 represent principal world stocks only, as supplied by the Department of Commerce. Figures since 1941 represent total world stocks, as compiled by the Commodity Exchange, Inc.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	13,437	13,355	11,376	15,565	7,314	13,946	14,896	16,333
Apr.-June	13,565	12,597	14,892	15,834	7,380	13,759	15,636	
July-Sept.	9,822	11,312	14,914	12,207	10,794	15,182	13,877	
Oct.-Dec.	10,406	12,099	14,858	9,704	12,360	14,726	14,777	
Total	47,230	49,363	56,040	53,310	37,848	57,613	59,186	

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,730	11,154	10,554	14,143	7,388	12,445	12,791	15,263
Apr.-June	14,998	13,473	15,940	15,741	9,564	15,107	17,595	
July-Sept.	11,648	13,489	14,037	13,106	11,243	15,791	12,904	
Oct.-Dec.	9,310	12,066	12,855	10,495	12,098	14,165	15,484	
Total	46,686	50,182	53,386	53,485	40,293	57,508	58,774	

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	11,651	11,675	8,762	12,004	10,547	9,963	10,789	10,149
Apr.-June	10,219	10,755	7,556	12,081	8,337	8,632	8,871	
July-Sept.	8,419	8,288	8,690	11,200	7,859	8,080	9,837	
Oct.-Dec.	9,455	8,196	10,717	10,383	8,166	8,665	9,127	

Figures for Recent Months

	PRODUCTION 1939	PRODUCTION 1940	PRODUCTION 1941	SHIPMENTS 1939	SHIPMENTS 1940	SHIPMENTS 1941	INVENTORY [2] 1939	INVENTORY [2] 1940	INVENTORY [2] 1941
Apr.	4,310	5,092	5,823	4,458	5,037	6,050	9,813	10,867	9,958
May	4,473	5,413	6,073	4,800	5,755	7,733	9,540	10,523	8,373
June	4,976	5,131		5,849	6,803		8,632	8,871	

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	12,823	12,553	11,891	15,831	7,314	12,383	12,801	15,349
Apr.-June	13,191	11,631	14,624	15,413	7,380	11,847	13,703	
July-Sept.	10,321	11,270	15,320	12,038	10,794	13,118	12,425	
Oct.-Dec.	9,891	12,425	15,201	9,092	12,360	13,300	13,308	
Total	46,226	47,879	57,036	52,374	37,848	50,648	52,237	

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,640	11,252	11,367	14,606	7,387	11,422	11,683	14,265
Apr.-June	14,553	11,928	15,113	15,495	9,564	13,010	14,978	
July-Sept.	11,545	13,251	15,069	12,901	11,243	13,449	11,344	
Oct.-Dec.	8,306	11,636	12,874	9,765	12,099	13,309	14,209	
Total	45,044	48,067	54,423	52,767	40,293	51,190	52,214	

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,244	10,406	8,660	11,993	10,547	8,752	8,110	8,143
Apr.-June	8,795	10,050	8,075	11,833	8,337	7,549	6,848	
July-Sept.	7,639	7,565	8,595	11,326	7,859	7,206	7,970	
Oct.-Dec.	9,180	8,231	10,945	10,312	8,166	7,036	7,017	

Figures for Recent Months

	PRODUCTION 1939	PRODUCTION 1940	PRODUCTION 1941	SHIPMENTS 1939	SHIPMENTS 1940	SHIPMENTS 1941	INVENTORY [2] 1939	INVENTORY [2] 1940	INVENTORY [2] 1941
Apr.	3,852	4,615	5,496	3,940	4,547	5,371	8,653	8,191	8,143
May	3,746	4,737	5,855	4,034	4,745	6,324	8,373	8,206	7,686
June	4,249	4,351		5,036	5,686		7,549	6,849	

[1] These figures are based on reports received from the Rubber Manufacturers Association. They are revised frequently and the latest available issue should be consulted for most reliable figures.

[2] Stocks held by manufacturers at end of period indicated.

Automobile Production

Year	United States Total	United States Passenger Cars	United States Trucks	Canada Total	Canada Passenger Cars	Canada Trucks	Grand Total
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,426	108,369	47,057	3,732,718
1940	4,469,354	3,692,328	777,026	222,984	110,126	112,858	4,692,338
1940							
Oct.	493,223	421,214	72,009	21,151	7,056	14,095	514,374
Nov.	487,352	407,091	80,261	23,621	10,814	12,807	510,973
Dec.	483,567	396,531	87,036	23,364	11,653	11,711	506,931
1941							
Jan.*	500,863	411,233	89,630	23,195	11,990	11,205	524,058
Feb.*	485,616	394,513	91,103	23,710	10,647	13,063	509,326
Mar.*	507,805	410,196	97,609	26,044	12,093	13,951	533,849
Apr.*	462,270	374,979	87,291	27,584	12,091	15,493	489,854
May	518,736	417,698	101,038	26,585	9,480	16,745	545,321
June	.....	.....	.....	.....	.....	.....	.....

* Revised.

Note: U. S. figures represent factory sales; Canadian, production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA							NETHERLAND INDIES						
	Gross Exports	Imports	Net Exports	Ceylon	India & Burma	Sarawak	British North Borneo	Thailand	Java & Madura	Sumatra E. Coast	Other N.I.	Indo-China	Amazon Valley	All Other	World Total
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,536
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,563
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,629

	British Malaya [1]	N.E.I.	Ceylon [2]	India & Burma [2]	North Borneo	Sarawak	Thailand	Indo-China	Oceania	Africa [3]	Liberia	South America	Mexico (Guayule)	Grand Total
1940	540,417	537,733	88,937	23,317	17,623	35,166	43,940	64,437	2,300	9,903	7,223	17,601	4,007	1,392,604
1940:														
Feb.	45,651	37,958	8,946	2,922	1,164	2,678	4,307	6,931	94	834	477	1,662	239	113,863
March	47,885	42,355	5,305	1,941	1,050	3,526	3,111	3,551	178	943	548	1,482	346	112,221
April	25,454	44,416	4,144	1,807	1,799	2,951	1,834	2,927	203	720	598	1,159	317	88,329
May	57,874	40,436	7,337	2,018	1,370	2,696	2,582	4,578	195	961	364	2,305	331	123,047
June	45,471	44,834	5,603	1,553	1,421	4,077	2,178	2,730	168	727	405	1,080	101	110,348
July	42,861	60,482	7,330	1,194	1,767	2,494	4,253	4,045	169	800	342	1,035	443	127,215
Aug.	45,872	45,078	8,139	1,332	1,593	2,640	4,545	7,337	285	800	308	1,233	327	120,729
Sept.	58,892	44,009	9,985	1,319	1,743	2,404	3,247	9,303	100	800	323	1,295	200	133,715
Oct.	52,767	50,139	8,127	1,841	1,693	2,564	3,355	2,082	200	800	600	1,860	200	126,228
Nov.	36,045	37,387	5,623	2,626	1,130	3,360	3,463	6,715	200	800	600	1,500	200	99,649
Dec.	56,263	35,325	10,700	3,405	1,028	3,520	5,343	9,000	200	600	813	1,427	392	128,216
1941:														
Jan.	37,804	58,593	7,866	2,434	2,085	2,445	2,137	9,058	250	800	750	2,103	250	126,575
Feb.	27,115	42,091	4,346	2,491	1,686	2,922	4,137	1,995	200	800	750	1,814	250	90,607
Mar.	56,651	53,313	6,074	2,764	1,154	3,726	5,712	6,286	200	800	750	1,500	250	139,180

(1) Including Brunei and Labuan; figures shown represent rubber which has actually been shipped and include rubber from the free stocks in Singapore and Penang. (2) Exports of domestic produce. (3) Exclusive of Liberia. Notes: Figures shown prior to 1940 were furnished by the United States Department of Commerce. Figures since 1940 were furnished by the International Rubber Regulation Committee, which accounts for the difference in the principal producing countries shown. Many figures for current months are provisional only and are later revised when more definite statistics are available. Therefore, it is suggested that figures from the most recent issue should be taken as more reliable.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	Total
1919	238,407	42,671	17,685	5,584	6,395	9,253	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,883	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,391	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1939	486,348				31,615	42,352			15,426	9,612	7,051				
1940	811,564														
1939:															
Sept.	36,197	4,406	4,000*	....	2,639	9,254	1,500*	2,000*	875	108	222	1,200*	200*	...	62,601
Oct.	39,735	8,530	5,000*	....	5,787	2,749	1,500*	2,000*	1,235	519	653	1,200*	200*	...	69,108
Nov.	41,478	10,500*	5,000*	....	1,709	5,104	1,500*	2,000*	1,200*	667	613	1,200*	200*	...	71,171
Dec.	70,302	5,200*	5,000*	....	3,025	3,961	1,500*	2,000*	1,200*	1,035	1,827	1,200*	200*	...	96,450
1940:															
Jan.	71,565	450	5,000*	....	5,047	4,540	1,500*	2,000*	1,921	891	682	1,200*	200*	....	....
Feb.	41,797	7,500	5,000*	....	3,508	5,241	1,500*	2,000*	1,846	694	495	1,200*	200*	....	....
Mar.	58,302	14,200	5,000*	....	3,062	6,057	1,500*	2,000*	1,784	....	627	1,200*	200*	....	....
Apr.	70,135	16,400	5,000*	....	3,096	2,000*	1,500*	2,000*	1,612	....	....	1,200*	200*	....	..
May	50,610	10,000	5,000*	....	3,108	2,500*	1,500*	2,000*	2,128	....	....	1,200*	200*	....	....
June	53,266	9,500	5,000*	....	1,062	3,000*	1,500*	2,000*	1,181	....	....	1,200*	200*	..	....
July	69,496	19,500	5,000*	....	5,112	3,000*	1,500*	2,000*	1,902	....	....	1,200*	200*	....	....
Aug.	72,612	21,250	5,000*	....	4,605	4,500*	1,500*	2,000*	2,508	..	..	1,200*	200*	....	....
Sept.	78,306	25,940	5,000*	....	2,743	....	1,500*	2,000*	2,485	....	....	1,200*	200*	....	....
Oct.	74,400	.....	5,000*	....	8,336	....	1,500*	2,000*	590	....	....	1,200*	200*	....	....
Nov.	72,775	.....	5,000*	....	5,451	....	1,500*	2,000*	1,366	....	....	1,200*	200*	....	....
Dec.	97,794	.....	5,000*	....	7,437	....	1,500*	2,000*	721	....	....	1,200*	200*	....	....
1941:															
Jan.	86,541	.....	5,000*	....	6,290	....	1,500*	2,000*	1,065	....	....	1,200*	200*	....	..
Feb.	73,647	.....	5,000*	....	3,770	....	1,500*	2,000*	1,717	....	....	1,200*	200*	....	....
Mar.	86,794	.....	5,000*	....	....	....	1,500*	2,000*	....	..	....	1,200*	200*	....	....
Apr.	63,071	.....	5,000*	....	....	....	1,500*	2,000*	....	....	....	1,200*	200*	....	....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. :—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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ACCELERATORS—
El-Sixty; Ureka; Ureka C; Guantal; Santocure; Pipsolene; RN-2 Crystals; DPG; Pip Pip; A-32; A-100; R-2 Crystals; A-10 • ANTIOXIDANTS —Flectols B, H, White; Santoflex B; Santovar A.
MONSANTO CHEMICAL CO.
Rubber Service Division
1012 Second National Bldg., Akron, Ohio

AERO BRAND RUBBER CHEMICALS
DPG—DOTG—Accelerator 49
Rubber Sulphur
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ALUMINUM FLAKE
A uniform, fine, low gravity, white reinforcing pigment. *Furnished to the rubber trade for 38 years.*
The Aluminum Flake Co.
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ANTIMONY Pentasulphide, golden and crimson, very fine, pure.
Rare Metal Products Co.
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Direct Factory Representation

ASBESTINE—Specially prepared for use in Rubber. Send for liberal working samples.
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CALCENE—The Ideal low gravity, white reinforcing pigment. Gives high tensile and elongation properties with exceptionally good resistance to tear and abrasion.
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CAMELINE WHITE CALCITE **FILLER**
99.75% 325 mesh, more than 90% minus 25 microns; soft, thin, platy particles, assuring better tensile, flexing and elongation.
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CONTINENTAL
The Newest Name in Carbon Black offers
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Arrow Black for rubber compounding. Standard for grit-free uniformity.
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CATALPO—The universal and standard rubber pigment now being used in treads, solids, tubes, carcass frictions, etc.
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Stocks Carried At All Times
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Cable Address: Jacobite Boston

CHEMICALS

For Rubber	For Industry Generally	
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Division of United States Rubber Co.
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Standard Since 1890
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Harmon Organic Rubber Color Granules are bright in shade and fast in cure. *Easy to weigh—Easy to disperse —Economical—Will not dust or fly.*
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BRILLIANT ORGANIC DYES; PERMANENT, NON-BLEEDING, LOW COST
For All Cures
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230 Park Ave. New York City

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U.S.P. Technical and Special Grades
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STEARIC ACID
STEAREX . . . CAKE or POWDER
STEAREX BEAD
Standardized Products for Rubber Compounding
MINERAL RUBBER (Parmr), TALC
SOAPSTONE
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41 East 42nd St. New York City

CUMAR —Paracoumarone Resin.
A neutral gum for rubber compounding.
Samples and prices on request.
The Barrett Company
40 Rector St. New York City

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Pure Oxides of Iron
Yellows—Reds—Browns—Black
MAGNETIC PIGMENT CO.
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Rubbermakers' TIRE BRAND and TUBE BRAND. Also CRYSTEX Insoluble Sulphur, Sulphur Chloride, Caustic Soda, Carbon Bi-Sulphide, Carbon Tetra-Chloride.
Stauffer Chemical Company
2710 Graybar Bldg., New York City

DU PONT Rubber Chemicals
DU PONT RUBBER COLORS
DU PONT ACCELERATORS
DU PONT ANTI-OXIDANTS
E. I. du Pont de Nemours & Co., Inc.
RUBBER CHEMICALS DIVISION
WILMINGTON, DELAWARE

PARA-DORS—
overcome odors in rubber—effectively and at low cost.
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Industrial Aromatics Division
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TITANIUM PIGMENTS
TITANOX-A (Titanium Dioxide)
TITANOX-B (Titanium Barium Pigment)
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The Universal Softener—Adaptable, Uniform. Improves Quality—Economical.
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ZINC OXIDES
AZO ZZZ Zinc Oxides
lead free—pure—uniform—dependable
AZO ZZZ-11 AZO ZZZ-55
AZO ZZZ-22 AZO ZZZ-44 AZO ZZZ-66
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—A cool mixing reinforcing black for Footwear and Mechanicals. Good ageing —Improved oil resistance.
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The Cryptones The Albaliths
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Manufactured by Our New Electrothermic Process
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ZINC LAURATE
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The Market Place

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All welded. Any size.
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